

The Mining Journal

Established 1835

Railway & Commercial Gazette

Vol. CCXLIV No. 6240

LONDON, MARCH 25, 1955

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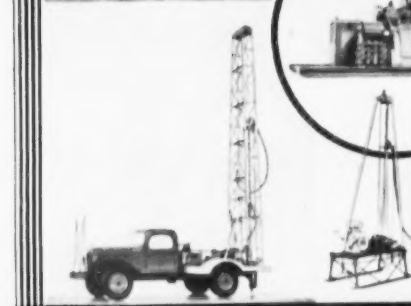
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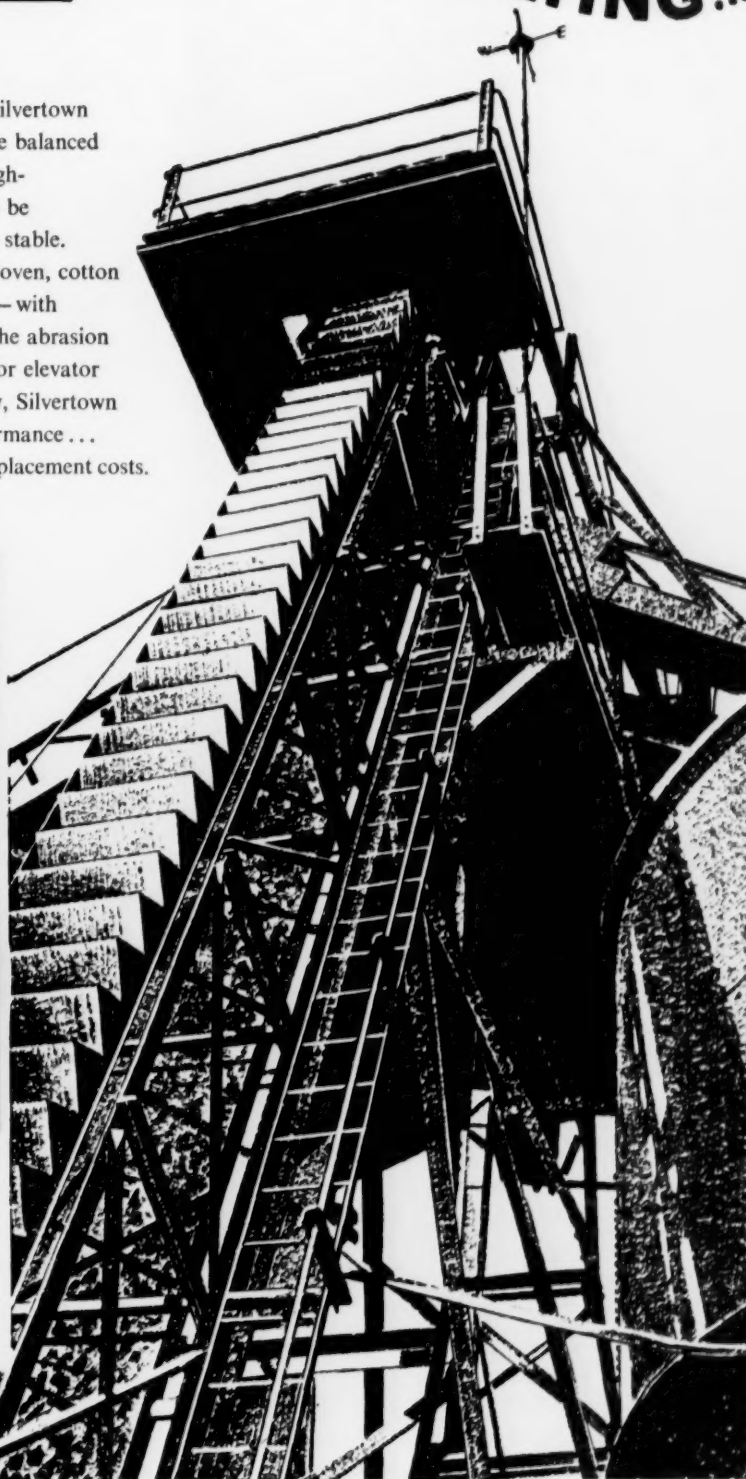
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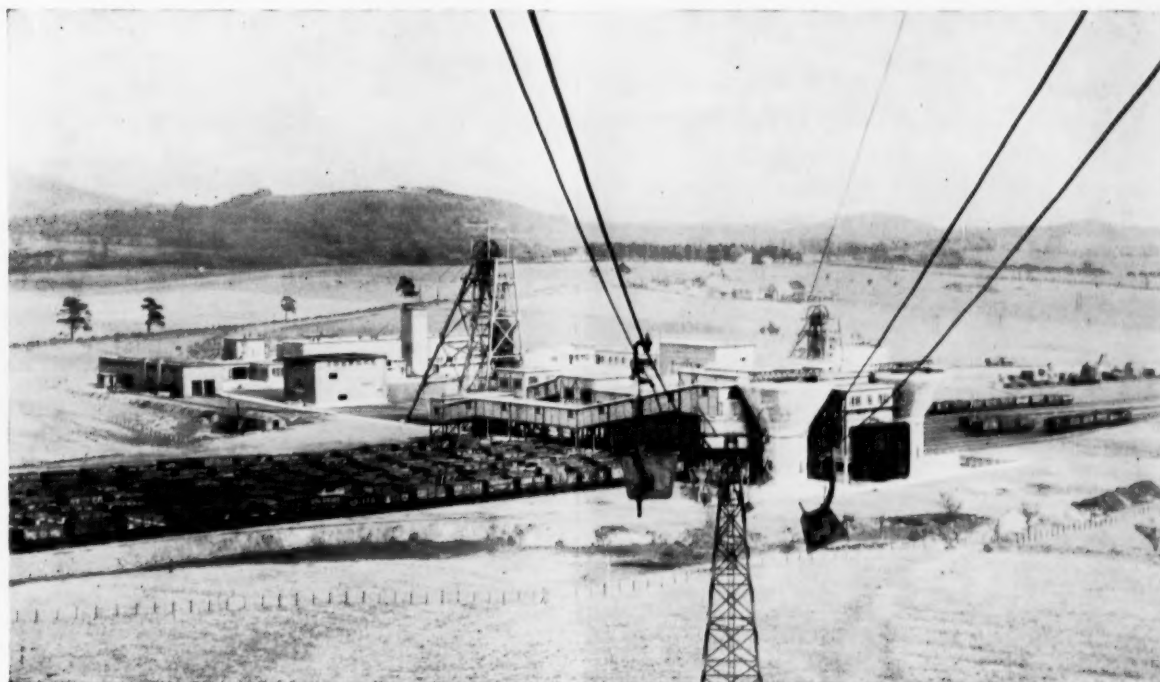
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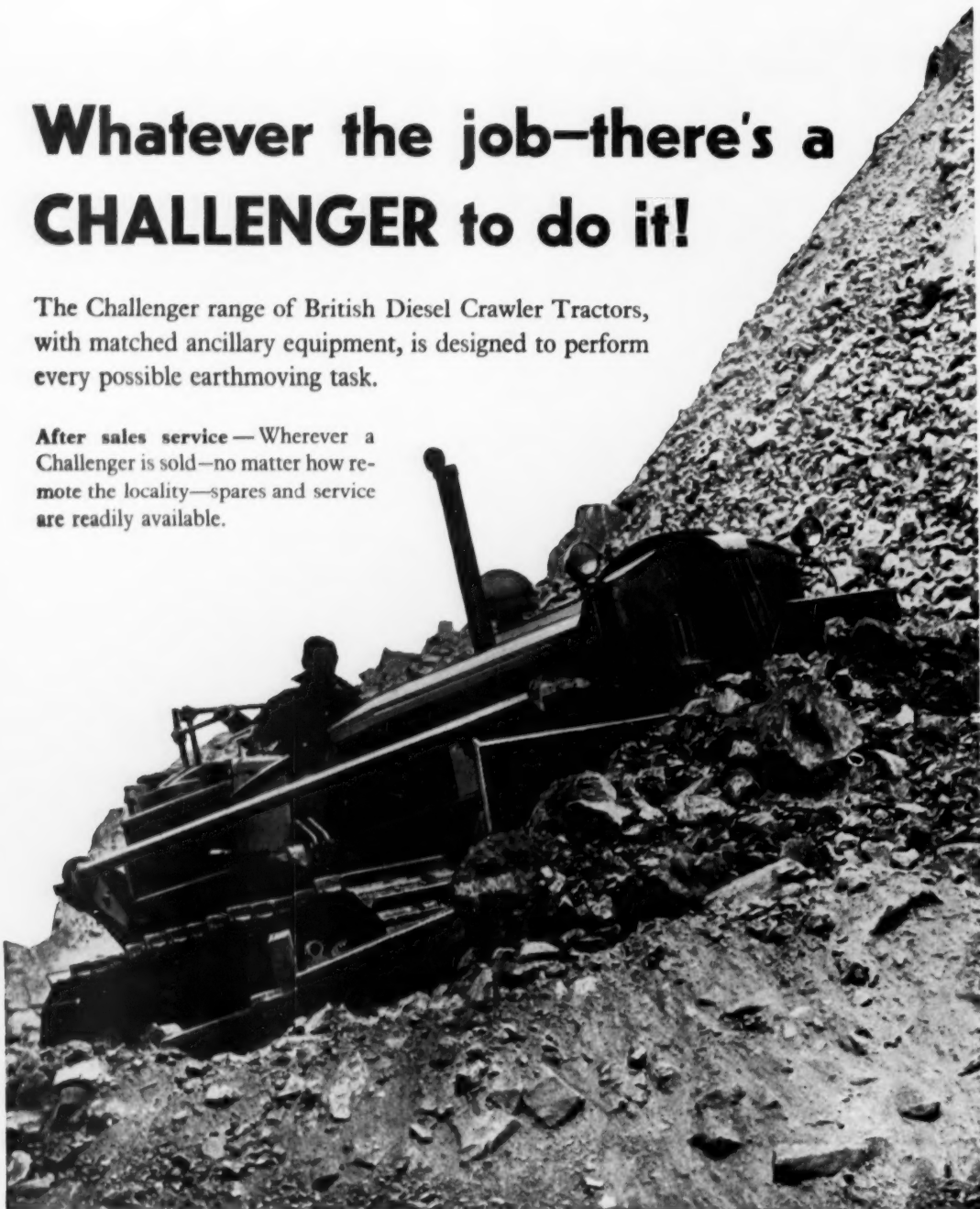
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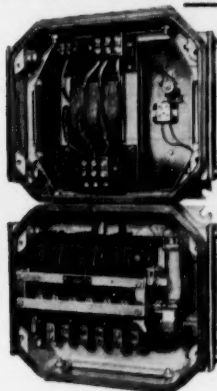
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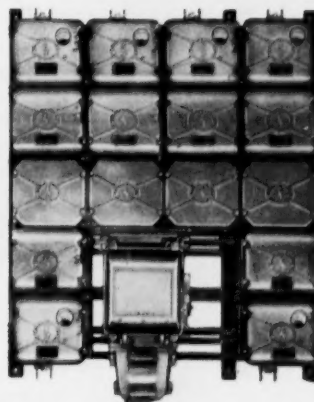


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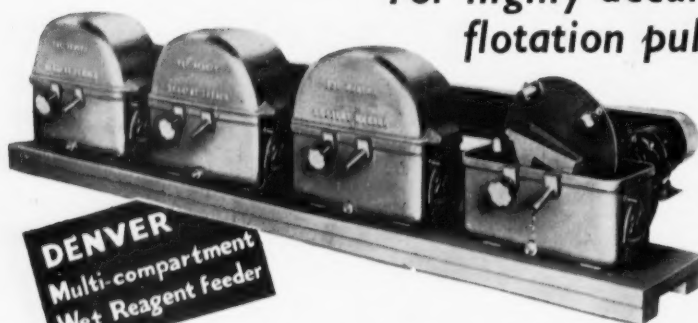
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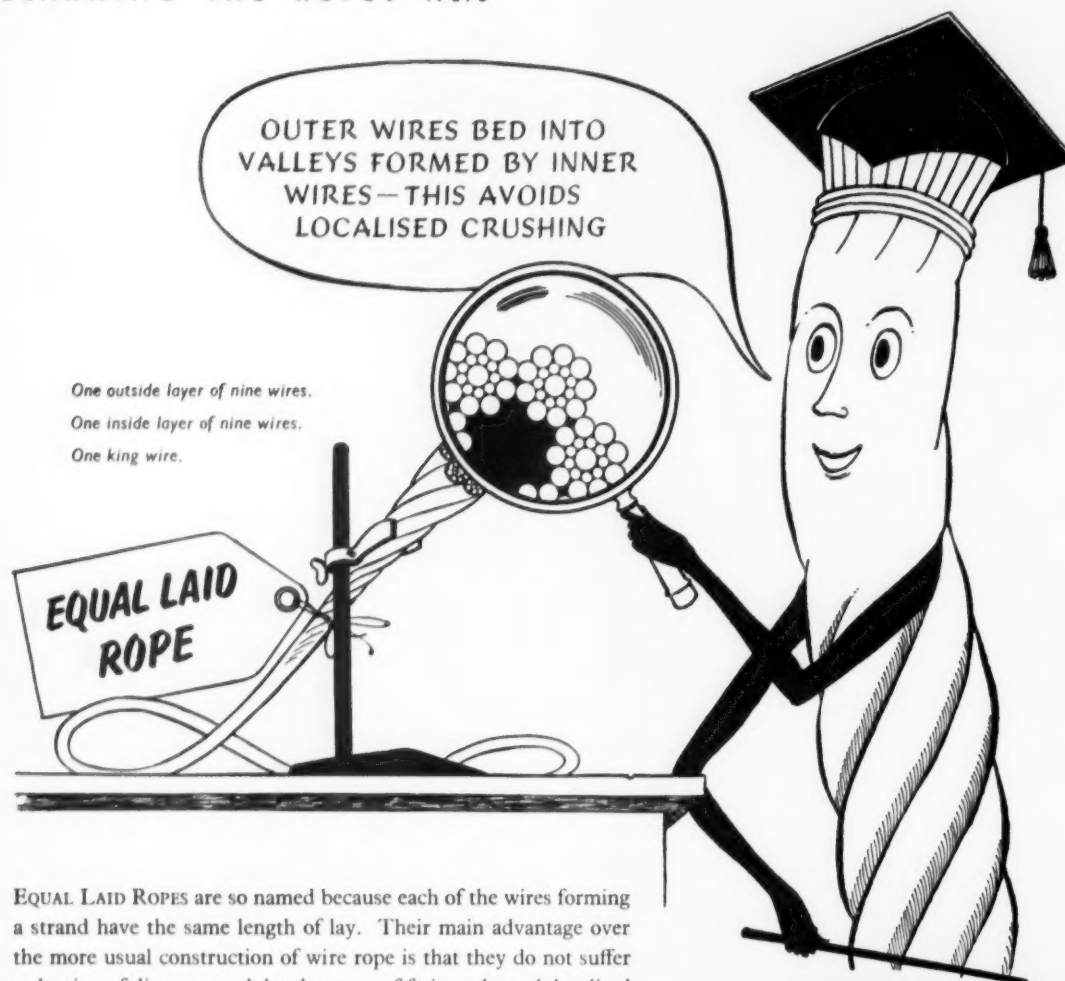
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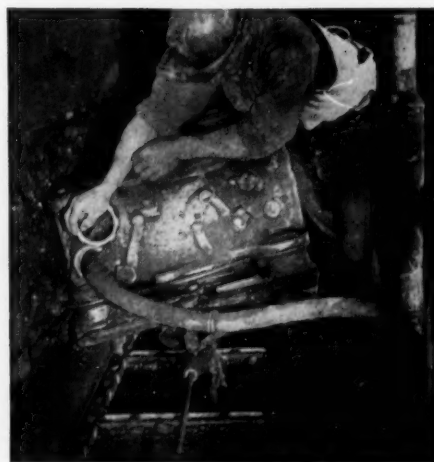


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The Mining Journal

Established 1835

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NOTES AND COMMENTS

British Exports and the O.T.C.

The contracting parties to G.A.T.T. went into conference in the early autumn of 1954 but it was well into this year before there was evidence of any substantial progress. Agreement—when it came in the form of the Organization for Trade Co-operation—came with a rush; and the O.T.C. that has emerged is less a triumph for the principles that the United Kingdom championed than a tribute to the tenacity of her delegates.

In point of fact the O.T.C. turns out to be very much like the old G.A.T.T. But for the United Kingdom the negotiations could not have been more different. First the negotiations differed in the technical sense that establishing G.A.T.T. meant promoting the universal use of most favoured nation treatment with the consequent decline of preference systems, while establishing O.T.C. has involved the control, when possible, of import quota restrictions. Secondly, in the negotiations leading to G.A.T.T. the United Kingdom was in many respects on the defensive, while in the recent discussions she has been the most outspoken critic of quotas.

To the United Kingdom it has seemed that, unless the right to control imports quantitatively is regulated, the benefits of tariff reductions are nullified. Clearly, she has failed to carry her case fully. The exceptions—covering under-developed countries, semi-developed countries in certain circumstances, American agriculture and developed countries in temporary balance of payments difficulties—are as carefully defined as it is possible to make them. But the consequences of these exceptions are impossible to forecast.

It is always easier to hold a line intact than to try to control the flow of impetuous traffic through a permitted breach. This, of course, is to put the gloomiest construction on the matter. It could equally well be argued that the authorized exceptions are down to the very minimum that the United Kingdom could have hoped for, that without them there could have been no agreement, and that without an agreement there would have been an unimpeded growth of quantitative trade restrictions and a revival of tariffs. In general, therefore, the United Kingdom's export trade should flourish at least as well as under G.A.T.T. and, because a modest attack has been made on quotas, may even do slightly better. More specifically, secondary industries, and particularly textiles, trying to make a living by export-

ing to designated under-developed countries will have a thin time.

The economic advantages of being "under-developed" are clearly going to be so great that the term will cease to carry a pejorative meaning. For the makers of mine equipment and machinery the outlook is mixed. There should be no difficulty at all in exporting heavy equipment to Australia, India or South Africa or to under-developed countries with mineral resources. But O.T.C. will probably quicken the existing tendency to establish manufacturing facilities overseas for such light equipment as helmets, mining lamps, certain types of belting, small motors and generators and tools. The cost of developing backyards is, relatively, going to be much less.

The greatest difficulty that British exporters will have to face is likely to be sudden import restrictions—as imposed by Australia—for balance of payments reasons because these have acquired, under supervision and temporarily, a certain righteousness. What the United Kingdom must hope for is the development of flexible credit policies so that credit restriction and not import quota will be the accepted weapon for fighting a temporary imbalance of trade. There are encouraging signs that such a development is under way in Europe, and especially in Scandinavia, but not yet, unfortunately, in the Near and Far East, Asia or Latin America.

S.A. Budget—No Change

As we go to press, the first flashes from South Africa indicate no major deviation from former financial policy. The year's surplus of some £10,000,000 is again being put through loan account. Although Mr. Louw, the new South African Finance Minister, admits to the more prosperous state of the Union's economy, he is giving little away. Import controls it seems, might be gradually eased, but other possibilities implied or suggested by the Minister do not amount to much either for U.K. investors or the South African mining industry—now described as the country's most stable source of overseas earnings.

No change is proposed in the taxation formulae applicable to gold and/or uranium mines, the position thus remaining that no tax is payable if the ratio of profits to recovery is 6 per cent or less. It is a thought to be kept

in mind that in due course the new higher grade mines in the O.F.S. and elsewhere will be fairly severely dealt with under the present formula as and when the amortization of pre-production capital expenditure runs out, and that a reshaping of the two basic formulae will sooner or later become desirable.

Aluminium Limited's Expansion Plans

Plans to expand the productive capacity of the Kitimat aluminium smelter in British Columbia to 330,000 tons per annum, or more than double the capacity now in operation or under construction, were announced last week.

It is expected that the cost of this new programme will be \$190,000,000 and that the financing of the successive stages of the programme will be largely, or entirely, met from the company's own resources. The estimated cost of the programme includes some further expansion of alumina facilities in Jamaica which will be additional to the immediate expansion announced earlier this month to 300,000 tons a year—an increase of 70,000 tons.

The present installed capacity of the Kitimat smelter, which came into operation last August, is 91,500 tons a year. A further 60,000 tons capacity was authorized last October and the programme now announced will add a further 180,000 tons. Accordingly, the total of new construction under way or scheduled is 240,000 tons capacity. By the end of 1956, 90,000 tons of this will be in operation, bringing the total installed capacity to 181,500 tons. The balance will come into operation in stages to be completed in 1959. However, the construction schedule may, of course, be revised, as the programme is reviewed periodically in the light of market and financial conditions.

Shipments of Canadian aluminium to both the U.S. and the U.K. are expected to reach new peaks next year. Shipments to the U.S. for 1954 were more than two-and-one-half times greater than in 1949, and to the U.K. nearly one-and-a-half times greater. Mr. Nathanael V. Davis, President of Aluminium Ltd., in making the foregoing announcement, said that "we expect this trend to continue and that because of the growing demand for our metal in all markets, and especially in the U.S., we have decided to expand further."

Alcan's firm decision now to raise production by a further 240,000 tons in the next four years may be taken as a measure of the extent to which world demand threatens now and later to outstrip production.

It may be no mere coincidence that Alcan's announcement has come during the week in which Washington is understood to be considering reopening the question of a domestic "third round" expansion programme in view of the present tight supply position. It will be recalled that this project was shelved last year, mainly on the grounds that the economies of power supply pointed to increased reliance on Canadian output as being preferable to promoting further high cost production in the States.

Aluminium's ability to achieve vast and rapid expansions in production while maintaining relatively stable prices stands in sharp contrast to the picture presented by copper producers who must be receiving this week's news with no particular enthusiasm. At the same time it would appear that aluminium's main sales effort is at present being directed to the constructional industries, so the threat to copper may be less immediate than it at first sight appears.

The Mining Industry in Sierra Leone

Prior to 1930 the colony of Sierra Leone was regarded as having no mineral deposits, or at any rate, none of economic value. Then alluvial platinum was recognized, and for some years some 500/600 oz. were produced

annually though production ceased in 1929.

About the same time, mining of alluvial gold began to appear in the government quarterlies rising to 40,764 crude oz. by 1936, since when it has dwindled and is now nearly extinct. However, the unexpected discovery of precious metals attracted attention to the mineral possibilities of this virgin territory, and though geological discovery of two gem stones in 1930, together with its survey reports, led to important prospecting and development activities by financially strong interests, more particularly in diamond and iron ore mining. Owing largely to there being no existing mining interests to consider and to the large tracts of unknown country to be explored, a system of monopoly and exclusive prospecting and mining rights was generally adopted and this probably accounts for the late appearance and rather uninformative character of the 1953 report of the Mines Department which has just reached us.

The value of the mineral output of the colony has grown steadily from £6,113 in 1930 to £6,063,717 in 1953 when expenditure by the industry was over £3,000,000. As the value or grade of ore or concentrates is not given there is little more to be learned from the Mines' Report regarding the relative importance of the three chief products—diamonds, iron and chromite, but there can be little doubt that the first named is the most valuable of the three. The three big interests, the Sierra Leone Selection Trust (diamonds), the Sierra Leone Development Co. (iron ore) and the Sierra Leone Chrome Mining Co. continued the vigorous prospecting operations throughout the dry season of 1953 and exploration of niobium-tantalite, titanium, monazite, manganese, and molybdenite possibilities, particularly by the Minerals Research Syndicate, were active.

As regards diamonds, little information is vouchsafed in the Report. Production increased from 452,618 ct. to 481,691 ct. the last return since 1950, but without figures of caratage little can be judged from this. Mechanization is increasing and more smaller stones may be included in the total. No doubt the output is regulated by the quota fixed by the Diamond Syndicate. It could clearly have been higher for of eight pan plants operated by the Sierra Leone Selection Trust only two were worked two shifts. The spread of illicit mining and trading was marked and "the seriousness of the situation," says the Report, "cannot be exaggerated." Apart from the loss of profits and Government revenue, deposits in remoter areas are being ravaged and overburden mixed with the gravels. The very wide distribution of the diamiferous gravels makes prevention of I.D.B. difficult. Nor were the ill effects of the illegal operations confined to the diamond field; natives were attracted away from other mining operations especially chromite and gold production. The Concessionaire Trust continued the active prospecting programme inaugurated in 1952, drilling and pitting and adding to its proved reserves.

Next to the diamond industry iron ore production and development was the most important section of the industry. Exports are given as 1,200,240 tons, a figure only surpassed in 1941, though elsewhere in the Report, 1952 is claimed as the boom year. Production was confined to the Marampa field but the Sierra Leone Development Co. was surveying a railway and a road route to the great Tonkalili fields. However, the very large undeveloped deposits more accessible for transport makes the opening of these areas a matter of no great urgency.

The chromite production of the Colony in 1953 was 24,354 tons, of which 11,477 tons were concentrates, compared with the previous record in 1952 of 23,493 tons. The Sierra Leone Chrome Mining Co. is in process of changing over from opencast to underground working and it was expected that routine underground workings would

be achieved last year by means of adit workings. The chromite occurrences are in a 70-mile belt in the south of the Protectorate area and the present mine is situated some 12 miles from the railway station of Hangha whence it is shipped to Cline Point, near Freetown, and loaded into freighters.

Gold mining is rapidly declining with the working out of the alluvials and the output for the year was the lowest since the war period at 1,609 crude oz. The Sierra Leone Development Co. had engineers prospecting a lode in the Tonkalili district by means of an adit but more work was necessary to enable a fair indication of the lode value to be secured. The dredge of the Pompana Mining Co. was handicapped by the rock bars on the river of that name and could only be worked regularly for four months.

Of manganese and the "new" metal ores there does not seem to have been any production, though the Minerals Research Syndicate and the Sierra Leone Development Co. did a considerable amount of prospecting and obtained a number of mining and extensive prospecting licences.

Owing to increasing mechanization and the attractions of illicit gold business the number of persons regularly engaged in mining fell to 7,138 compared with 7,594 in the previous year.

Canada

(From Our Own Correspondent)

Sault Ste. Marie, March 10.

The importance of the St. Lawrence Seaway, the construction of which commenced late in 1954, does not appear to have been fully grasped in the minds of Canadians as a whole—nor have the Americans to the south appeared to realize the full significance of that development. Only those who have studied world history in the light of trade and commerce and who understand the advantage of ocean shipping over railway transportation are able to visualize the impact the St. Lawrence Seaway will exercise in the channels of trade and commerce of North America.

Based on the evidence, and despite restrictions imposed upon navigation because of winter ice, it does appear as though not much imagination is required to foresee a great and growing port of commerce established at the westerly reaches of Lake Erie in the vicinity of Cleveland and Toledo. In and out of such a port will eventually be funnelled a large part of the commerce of the north-central part of the United States which heretofore has moved by railway to and from the Atlantic seaboard. Nor will the shifting of the channels of commerce be confined to that one port in relation to the United States.

Another such development may reasonably be expected to occur at the southerly reaches of Lake Michigan in the vicinity of Chicago and Milwaukee. There are some close observers who believe that in the next quarter century the volume of commerce moving through the ports at the head of the new seaway may closely approach that of the port of New York, and with the thought in mind that where goes commerce there also goes the centres of finance. As for Canada itself, the advantages of the St. Lawrence-Great Lakes Seaway are almost incalculable, more particularly to industrial Ontario.

At the outset of development there has been a tendency to focus attention upon the cost of building the seaway rather than the advantages to be realized. The truth is that the expenditures ultimately likely to be required in providing harbour and port facilities at many places adjacent to the Great Lakes in both Canada and the United States, as

well as the improvement of other channels, may far exceed the costs involved in building the deep seaway itself.

TITANIUM PRODUCTION

Titanium production in Canada continues to struggle under the handicap of not yet having discovered a process through which the cost of the metal can be lowered to a competitive level with other metals. However, capital is being poured into the effort in large volume in the work of research. Quebec Iron and Titanium Corporation has what is believed to be the world's largest known deposit of ilmenite at Lake Allard in Quebec, and is operating its smelter at Sorel on the St. Lawrence. The plant has an annual titanium dioxide capacity of 250,000 tons. During 1954 slag to the value of more than \$1,000,000 was shipped from the Sorel plant to the United States as titanium pigments used chiefly for paints. Meanwhile, Shawinigan Water and Power Co. is conducting experiments in a pilot plant employing a new and revolutionary process which is believed to hold the secret to lower costs of producing titanium. It is understood that Shawinigan is now actually producing on a small scale in the new pilot plant, which is stated to be working well.

MINING LEGISLATION

The Ontario government has presented proposed new legislation designed to permit prospectors to stake 18 mining claims on one license rather than nine claims as heretofore. However, such staking may be carried out in only two mining divisions instead of in each one of the several mining divisions in the province. The proposed bill would also increase Miners' Licences from \$5 to \$10, and would also double the acreage fee from \$3 to \$6 per acre at time of patent.

The Pine Point property of Con. Mining and Smelting Co. at Great Slave Lake in the Northwest Territories is believed to rank among the largest lead-zinc deposits so far discovered on the continent. The preliminary drilling has led to preliminary estimations of some 120,000,000 tons of ore indicated, carrying an average of four per cent lead and more than seven per cent zinc. The property on which these deposits lie has a length of 36 miles by a width of three miles. The outlook is that discussions may develop within the next few months looking toward the possibility of building a new railway to the Pine Point Mine, probably to follow a route of 430 miles from Grimshaw in Alberta.

DOLLAR VALUE AIDS GOLD MINING

What is believed to be a carefully considered effort to reduce the value of the Canadian dollar to the level of the United States dollar is resulting in a moderate increase in the price the gold producers in Canada receive for their product, having in mind that payment is received in the form of American dollars. Meanwhile, however, economic conditions continue to be unfavourable for gold mining due to the high wage standards of the present together with continued high cost of hydro-electric power, and general supplies.

Quebec Lithium Corporation will begin mill construction before the end of April. The plan will be designed for a minimum of 1,000 tons of ore daily. In addition to the \$1,800,000 initially provided for development and construction, a further \$1,650,000 was added at the beginning of March. Diamond drilling to date has indicated some 15,000,000 tons of ore which grades 1.20 per cent lithia, in a deposit which has a width of about 34 ft. The three-compartment working shaft is down 325 ft. and will be carried to 650 ft. as quickly as possible so as to prepare the underground for production at such time as mill construction can be completed.

Open Pit Mining at Nchanga Consolidated Copper Mines, Northern Rhodesia

A large new open pit mining project being undertaken by Nchanga Consolidated Copper Mines in Northern Rhodesia will ensure that large reserves of ore, hitherto virtually untouched, will become available. These reserves are of lower grade than the ore at present being mined but by increasing the milling rate commensurately, the annual output of copper will be maintained at approximately the present rate. The following article, by H. E. Nelema, B.A.Sc., M.I.M.M., general manager of Nchanga Consolidated Copper Mines Ltd., explains why it was decided to use open pit methods and discusses the benefits that the practice will promote. This article is a condensation from *Optima*, Vol. 5, No. 1, a quarterly review published by the Anglo American Corporation of South Africa.

Copper was first discovered at Nchanga in 1923 by The Rhodesian Congo Border Concessions, Limited, which had been granted exclusive prospecting rights in certain areas of Northern Rhodesia. Subsequently, an extensive prospecting programme of trenching and diamond drilling was carried out by that company, resulting in the discovery of a substantial orebody, now identified as the Nchanga Orebody.

In 1926 Nchanga Copper Mines, Limited, was formed as a private company in London. Anglo American Corporation of South Africa, Limited, became interested in the deposit and sent their consulting geologist, Dr. J. A. Bancroft, to Nchanga in 1928. Dr. Bancroft continued, and extended, the drilling programme, which resulted in the discovery of the rich Nchanga West Orebody. Shaft-sinking was commenced and, subsequently, an appreciable amount of development was conducted on the Nchanga West horizon until, in 1931, the workings became flooded and operations were abandoned. In 1937, the present company was organized; the mine was successfully dewatered, and, in 1938, underground mining operations were resumed on the Nchanga West Orebody.

OUTPUT AT NCHANGA

Copper production began at Nchanga in 1939, and the mining method that has been exclusively used has been the continuous cave method. This method has been described most recently by O. B. Bennett in the June, 1953, issue of *Optima*, when he discussed large-scale mining methods on the Copperbelt. The continuous cave method has served, and will continue to serve, this company extremely well.

A progressive programme of expansion in the scale of operations at Nchanga has brought the rate of copper output to a level commensurate with the mine's theoretical potential; but this optimum rate of copper production has been achieved by mining exclusively from the rich copper-bearing ore reserves in the Nchanga West Orebody, and the less rich—but still potentially profitable—Nchanga Orebody has been virtually neglected.

A MOVE TO BALANCED PRODUCTION

The company now proposes to take the further and ultimate step to the ideal state of balanced production when, without any reduction in the total tonnage of copper actually produced every year, it will nevertheless be possible to mill ore drawn simultaneously from both the rich and the less rich orebodies, so that the average grade of the combined tonnages approximately conforms with the estimated average grade of the total proved ore reserves of the whole property. This involves a substantial increase in the rate of milling and, as an essential preliminary, an equivalent increase in the tonnage of ore made available from the reserves.

While various considerations have influenced this development in milling policy, the main reason lies in the

fact that the value of the ore being mined under present conditions is considerably in excess of the average grade of the mine as a whole. The new milling policy will mean that the mine will exploit its property to the fullest extent by embracing—without any sacrifice of total production of copper—vast and hitherto largely untapped resources of lower-grade ore.

ORE RESERVES

For all practical purposes the ore reserves of the mine, upon which present and future mining depends, are contained within the two orebodies already mentioned—the rich Nchanga West Orebody and the less rich Nchanga Orebody.

Early estimates of ore reserves have been reconciled as at April 1, 1954, as:

Orebody	Tonnage	Value
Nchanga West	37,029,984	7.06% Cu 3.12% A.S.Cu
Nchanga	89,551,566	3.48% Cu 2.19% A.S.Cu

Surface diamond drilling is proceeding with the object of exploring possible extensions of the ore reserves; and, although the full extent of the additional reserves cannot be defined until further drilling has been done, the results already achieved indicate an addition to the Nchanga West reserves of some 14,500,000 tons of ore containing 6.48 per cent Cu (which includes 2.12 per cent A.S.Cu). These orebodies lie within a syncline, and are contained within a succession of formations. The Nchanga (or Upper) Orebody overlies the Nchanga West Orebody in certain areas, and they are separated by thicknesses varying from 50 to 250 ft. of different rock strata, the bulk of which can be classified as Banded Sandstones or Shale.

WORKING TO THE GRADE OF THE MINE

Hitherto, mining has been confined to the Nchanga West Orebody, the value of which is in the region of 7 per cent Cu, and the value of the total ore reserves is in the region of 4.6 per cent Cu.

So long as there is a significant disparity between the grade of ore being currently mined and the grade of the total ore reserves, an unbalanced condition exists. This state of over-mining can with advantage be resorted to on occasions and for relatively short periods, in order to achieve a specific objective, so long as plans are in hand to correct the position as soon as possible after the objective has been achieved. In the case of the Nchanga Company, the over-mining that has been in progress for some years has enabled the mine to be placed on a most substantial profit basis in a relatively short time. It now remains only to readjust the value of the ore being currently mined to that of the ore reserves.

Bearing in mind the fact that a copper production rate has been fixed in relation to the magnitude of the total ore reserves, and taking into account the fact that the mine is in its early productive years, the only practicable

method of redressing the balance in mining and milling is to increase the tonnage milled so that the current rate of copper production will be maintained even though the grade of the ore being mined is scaled down to an average value approximately the same as the average value of the total ore reserves.

Having accepted that it is necessary to increase the tonnage milled substantially, with a consequent adjustment of grade, the remaining problems are where to expand the mining front and by what method of mining. A further examination of the position led to the conclusion that the only logical point of attack was in the eastern section of the mine in the upper reaches of the Nchanga Orebody and where the Nchanga West Orebody does not underlie the Nchanga Orebody.

OBSTACLES TO UNDERGROUND MINING

The present continuous cave mining method was established on the Nchanga West Orebody, and the nature of the rock in this lower horizon lent itself to the development of this highly successful technique. Extraction workings were placed in the Arkose formation immediately underlying the orebody, and this formation has proved to be uniformly strong and altogether suitable for the purpose. The generally friable rocks of the Nchanga West Orebody itself have proved suitable for caving.

Exploratory development carried out earlier in the upper reaches of the eastern section of the mine, with a view to the possible extension of mining operations, showed that the favourable mining conditions encountered below the Nchanga West Orebody did not obtain in this region, and the rocks in the footwall of the Nchanga Orebody proved to be so weak and incoherent that it would have been extremely difficult—if not impracticable—to develop any successful underground mining method on this higher elevation on the scale visualized as being necessary.

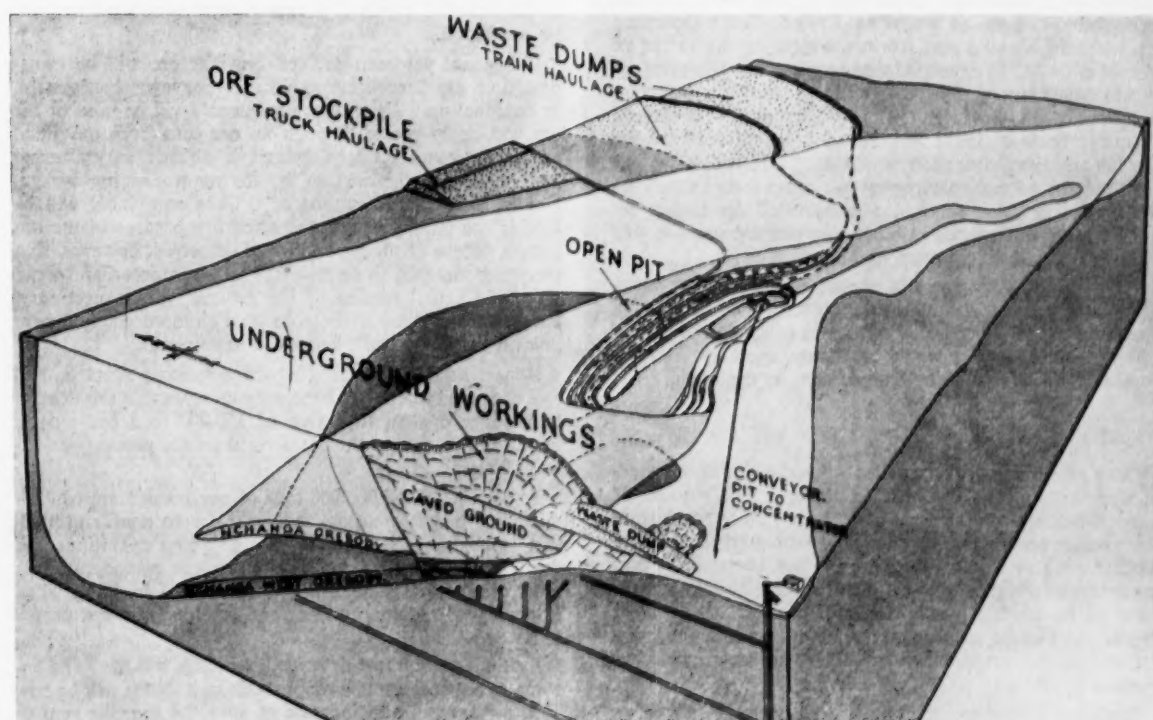
In view of this difficult position, attention was turned

to another mining method—namely, open pit mining, which, it was thought, might have distinct possibilities of success if applied to the upper reaches of the Nchanga Orebody in the area under consideration. In that area the orebody, which dips at 25 deg. and averages about 80 ft. in thickness stratigraphically, has a sub-outcrop at a depth from surface varying in different localities between 50 ft. and 120 ft. Accordingly, a thorough investigation of this area was made by sinking a number of small shafts to varying depths along the line of the sub-outcrop of the orebody and driving crosscuts from these pits in a northerly direction in order to intersect the various formations. The haulage drives on the 480-ft. and 625-ft. levels in this area were extended to the east and west. From the extension of these drives and the pit crosscuts, diamond drill holes were put in to intersect these same horizons. The object of this work was not only to examine the orebody and the nature of the surrounding country rocks but also to delineate an ore reserve that would be sufficiently large to justify the establishment of facilities that would produce upwards of 150,000 tons of ore per month.

ECONOMIES FROM OPEN PIT WORKING

The features of existing open pit mining practice were examined in various parts of the world to find out whether such methods could be applied at Nchanga. From these investigations it became apparent that the open pit mining method was inevitably the right one for the conditions obtaining in the upper reaches of the Nchanga Orebody. Indeed, if an underground mining method were to be attempted in that area on the scale visualized, it is estimated that the employment of some 220 Europeans and 1,800 Africans would be needed.

The estimates mentioned are based on the productivity of those persons now working on the Nchanga West Orebody. As there would be difficulties in mining the Nchanga orebody by underground methods, considerably less efficiency



Nchanga open pit in relation to underground workings

might be expected on the Nchanga Orebody. Also, with the development of an underground system, it is likely that substantial tonnages of payable ground adjoining the sub-outcrop would have to be abandoned, that an ore recovery greater than about 75 per cent could not be expected, and that the inevitable mining of waste rock with the ore would dilute the grade appreciably. As opposed to these obvious deficiencies—that would probably be inherent in any underground mining system in that area—an open pit method seems to be a constructive and attractive alternative.

FAVOURABLE COST ESTIMATES

The labour needed to operate an open pit at Nchanga on a scale that would enable about 150,000 tons to be milled per month is estimated, at the outside, at 40 Europeans and 400 Africans. The cost per ton of rock handled in open pit operation is difficult to estimate by comparison with similar operations in other countries because of the differences in wages and cost structures. But by applying productivity factors that are reasonable by Rhodesian standards, by observing some of the basic principles in the application of this type of mining, and by translating material costs into Rhodesian currency, an estimated 1.3 shillings per overall ton of rock handled has been reached.

This means that the cost per ton of ore produced is arrived at by multiplying the estimated cost per ton of rock handled by the number of tons of waste that must be removed in order to obtain a ton of ore, a cost figure that would increase progressively as the operation went deeper. The cost figure that applies when the stripping ratio has increased to 10 waste to one ore would compare favourably with present mining costs and would probably compare extremely favourably with the equivalent underground costs on the Nchanga Orebody.

While the capital necessary to equip an open pit operation on the scale visualized has been worked out in some detail, no such attempt was made in respect of an equivalent underground operation. It is known, however, that the underground operation would have required, for European and African housing and services, capital to the extent of almost £900,000 in excess of that required for the open pit operation. Thus, when the establishment of a production unit is visualized in terms of 150,000 tons of ore per month, there can be little doubt that the total capital required for the underground operation would be far in excess of that required for an equivalent open pit operation. In making the comparison, no account was taken of the capital required for plant extensions, since any amount spent in this direction would be common to both systems.

Beyond these differences in capital and in working costs, other advantages in favour of the open pit method became apparent when it was considered that an extraction of almost 100 per cent of the ore would be obtained and that dilution from waste rock would, by comparison, be negligible.

WIDENING SCOPE FOR OPEN PIT MINING

Open pit mining can be applied when the amount of overburden that must be removed to obtain a unit amount of mineral-bearing ore is not so great as to render the extraction process uneconomical. The many factors inherent in the process, such as ratio of waste rock to ore, the grade of ore, the nature of the ground to be mined and the types of equipment to be used, all have a profound effect. A correct appreciation of the influence these factors are likely to exert determines the profitability or otherwise of a projected process.

Open pit mining methods have a characteristically high rate of production in relation to the amount of labour. These methods have come into greater prominence during

recent years, owing mainly to the rapid and substantial advance in mechanical and electrical design as applied to earth handling and drilling equipment.

The comparatively recent development of modern earth-handling equipment has made possible profitable operations that would have been completely impracticable a few years ago. It has also prolonged the life of a number of mines because of the ever-increasing productivity factor. In other cases, underground operations that have been rendered unpayable by the rising cost structure have been converted into extremely profitable open pit operations. This type of equipment is developing so rapidly that the scope for open pit mining is continually broadening.

Open pit mining is now about to be applied at Nchanga in the eastern section of the mine on the Nchanga Orebody. The initial pit has been laid out over a strike distance of 3,500 ft. with a view to working ultimately to a depth of 800 ft. While the ore reserve of this section has been estimated at 33,000,000 tons, it is known that the pit will probably have an appreciable extension to the east where boreholes from the surface have indicated an extension of the ore that can be profitably worked by this method.

PLANT TO BE USED AT NCHANGA

The nature of the deposit excludes the use of dragline equipment, but conventional and proven types of equipment will be used. The main items of equipment will be 6 cu. yd. capacity electrically driven shovels for primary duty; 1½ cu. yd. Diesel driven shovels for auxiliary work. Diesel and Diesel-electric driven railway units pulling a train of eight side-discharge wagons, each having a capacity of 28 cu. yd., will be used as the main waste disposal equipment, operating on 81-lb. track over a maximum distance of two miles to the waste disposal site from the centre of gravity of the pit. In addition, two types of vehicles will be used for the handling of ore and minor amounts of waste: a 22-ton end-discharge truck and a 34-ton side-tipping trailer used in conjunction with a tractor. Conventional caterpillar track type bulldozers and standard pneumatic tyred road-graders will be employed.

It has not yet been decided how the ore will be transported to the concentrator; either a conveyor belt system, in conjunction with crusher equipment, will be used or the ore will be by-passed through an ore pass from the pit to an underground haulage (which is already in existence) and hoisted to the surface by the main hoisting system. Nor is it known what type of drilling equipment will be used in the mining of the waste and ore because of the unknown nature of the ground. It is suspected, however, that the waste material to be mined is so decomposed and weak that little actual mining of the ground will be necessary. Percussion drills are likely to be used on the orebody, where holes 6 in. in dia. will be spaced at intervals.

Repair and maintenance shops are being erected, and sufficient equipment has been ordered to enable this section to produce ore up to a rate of 150,000 tons per month. Much of this equipment has arrived on the property and is being assembled.

Some 7,000,000-8,000,000 tons of overburden must be removed in order to expose sufficient ore to enable production to begin. It is expected that stripping operations will begin about mid-1955 and will progress at a moderate rate until production is due to commence late in 1956, when extensions to the concentrator and leach plant are expected to be complete.

By the development described, not only will the mine become as a whole a much more stable unit, but it will be possible more readily to increase or vary the tonnage sent to the mill, and a high degree of flexibility will be introduced into the mining operations.

COLUMBITE—II

Determination of Columbite Content

By K. F. G. HOSKING, M.Sc., Ph.D., A.M.I.M.M.

The following article is the second and concluding portion of a paper entitled *The Occurrence, Properties, Detection, Estimation and Search for Columbite*, which was presented to the Cornish Institute of Mining Engineers at the Camborne School of Mines on January 19, 1955. Certain tests indicated briefly at the conclusion of the preceding instalment are discussed more fully in the introductory portion of the article appearing below, while subsequently methods of determining columbite content and the search for columbite are fully described. Other articles on columbite and its applications will follow as part of this series.

The two tests previously noted briefly are particularly useful for detecting appreciable quantities (say not less than 5 per cent) of niobium/tantalum in most mono-mineralic and composite samples in which the elements are likely to occur.

TARTARIC ACID HYDROLYSIS TEST

Under the conditions of this test, tungsten—the only interfering element—causes the development of a yellow precipitate, the colour of which is masked when the sample contains only a few per cent of WO_3 and 60 to 70 per cent of Nb_2O_5/Ta_2O_5 .

As the solution in which the precipitate develops is yellow because of the presence of iron, the colour of the precipitate can only be evaluated after the latter has been removed by filtration and washed, or after the colour of the solution has been destroyed by dilution with water. However, the development of a precipitate is normally reliable evidence of the presence of niobium/tantalum when Nigerian products are subjected to the above test, as there is comparatively little tungsten mineralization in the country.

When a considerable quantity of niobium/tantalum is present in the sample the writer has found that the test may be carried out quite adequately by conducting the fusion and the subsequent acid treatments in a single hard-glass test tube.

THE REDUCTION TEST

The reduction test, under appropriate conditions, enables niobium, tantalum, titanium and tungsten to be detected.

About 0.25 g. of the finely-powdered sample is fused in a silica crucible with potassium bisulphate. (A "primus" or blow-lamp may be used as the source of heat in the field.) The melt is dissolved by boiling it in a boiling tube with concentrated HCl. A white precipitate or cloudy suspension at this stage indicates the presence of niobium and/or tantalum. After sufficient 5N HCl has been added to increase the volume of solution to about 20 ml. the latter is warmed and a few fragments of either zinc or tin are added. Under these conditions titanium gives a violet solution and both niobium and tungsten yield blue solutions: tantalum causes the development of a white precipitate.

In discussing this test, it is pertinent to comment that tin reacts much slower than zinc with the acid, but the writer prefers the former as the slower reduction occasioned by its use enables subsequent changes in the colour of the test solution to be much more readily appreciated. Thus, when tin is employed, a solution rich in tungsten rapidly becomes inky-blue, whereas a niobium-rich solution becomes sky-blue and a solution derived from the treatment of tantalite develops a white precipitate which may show little or no "niobium-blue" until an hour has elapsed.

Further comment is that the presence of niobium in a Nigerian columbite/ilmenite sample which contains as little

as 7 per cent columbite can be detected by the above tin-reduction test. Under such circumstances the presence of titanium is indicated by the development of a clear violet solution and that of niobium by a strong blue colour which is associated with the undissolved tin and which can be seen best by looking through the bottom of the tube.

The tin-reduction test has proved to be a suitable means of differentiating between ilmenite and ilmenorutile. Whilst ilmenite results solely in a violet solution, ilmenorutile causes the production of a violet solution together with a white precipitate with a "niobium-blue" base.

DETERMINING COLUMBITE CONTENT

In essence, the procedures adopted for prospecting alluvial and eluvial deposits for columbite are the same as those employed when examining similar types of deposit for cassiterite, and involve pitting and/or Banka drilling the ground on a grid, taking samples from various horizons to bed-rock and examining them quantitatively in order to determine the distribution and amount of the sought after mineral.

Methods employed in Nigeria for determining the percentage of columbite in a given sample vary, but with experience a useful result may be obtained by making a crude concentrate by panning or calabashing a known quantity of sample, separating the concentrate into a magnetic and a non-magnetic fraction and weighing both fractions; the specific gravity of the magnetic fraction is then obtained by a displacement method. The process is continued by estimating the percentage of cassiterite in the magnetic fraction after "tinning" the species by treatment with zinc and dilute HCl in order to facilitate recognition, determining the percentage of columbite in the magnetic fraction by applying the formula below, and finally calculating the percentage (and lb. per cu. yd.) of columbite in the original sample.

The formula applied to obtain the percentage of columbite (x) in the magnetic fraction is:

$$\frac{\%SnO_2}{7} + \frac{100 - \%SnO_2 - x}{4.5} + \frac{x}{5.5} = \frac{100}{8}$$

In the above formula S is the specific gravity of the magnetic fraction and $\%SnO_2$ is the estimated gravity percentage of cassiterite in the fraction. A much more reliable indication of the amount of columbite in the sample can be obtained by subjecting the crude concentrate to a quick assay which is based on the tartaric acid hydrolysis test described above and which is discussed and described in a recently prepared paper by Polkinghorne. The value of promising ground may also be confirmed by subjecting appropriate samples to small-scale mill-tests.

Prospecting for primary deposits of columbite involves the search for columbite-rich granite outcrops and when one is discovered the mapping of its outcrop and subsequently the determination of the quantity of columbite available in the superficial, decomposed—and therefore readily mined—portions of the mass.

Up to the present the discovery of columbite-rich granite outcrops has resulted from the examination of samples of the granites in the vicinity of rich secondary columbite deposits by a variety of methods. Having proved the existence of such granite in a given area its lateral extent may be established by determining the columbite content in samples obtained by drilling on a grid. Sometimes mineralogical differences between a given columbite-rich granite and the granites adjacent to it may make the mapping of the former comparatively easy. Thus, the writer was able to determine the extent of a certain columbite-rich granite in Nigeria because it, unlike the granites with which it was spatially related, was characterized by the presence of doubly-terminated quartz crystals. So, whenever the soil contained an abundance of these crystals it was reasonably safe to assume that it was, for all practical purposes, overlying the columbite-rich granite. The same granite also contained considerably more thorite and malacon than the adjacent granites and was, consequently, considerably more radioactive. Thus, its outcrop could be established by a radiometric survey. It is possible that radiometric methods might be usefully employed to locate columbite-rich granites elsewhere in Nigeria.

It is probable that columbite-rich granite could be located, and its outcropping portion delineated by employing geochemical methods of prospecting. (Such methods might also enable deep-leads of columbite to be located beneath the basalt flows in Nigeria.) In essence, such methods involve the taking of small samples of soil from an appropriate horizon and at pre-determined points on the ground, and then subjecting these samples to rapid semi-quantitative analysis in order to locate any points where the niobium content of the soil is unusually high. A colorimetric and a chromatographic method of determining niobium in soils have been developed. However, although these analytical methods are comparatively simple, geochemical prospecting programmes should only be undertaken by those who have given considerable time to the study of the subject.

DETERMINING NIOBIUM IN SOILS

A colorimetric method of determining niobium in soils¹¹ depends on the fact that niobium reacts with the thiocyanate ion in a hydrochloric acid solution of stannous chloride forming a yellow product. If tartaric acid is also added and then the solution is shaken with ether, interference due to iron, uranium, titanium, vanadium, molybdenum and tungsten is largely eliminated and the niobium compound reports in the ether layer. The ether layer is separated from the aqueous phase and its colour is compared with those of standard solutions. The quantity of niobium in samples which contain from 250 to 1,000 p.p.m. of the element can be determined by this method and an experienced person can carry out from 30 to 40 estimations per day. The niobium is brought into solution initially by fusing a known quantity of the soil sample with sodium bisulphate in a test tube and extracting the melt with tartaric acid.

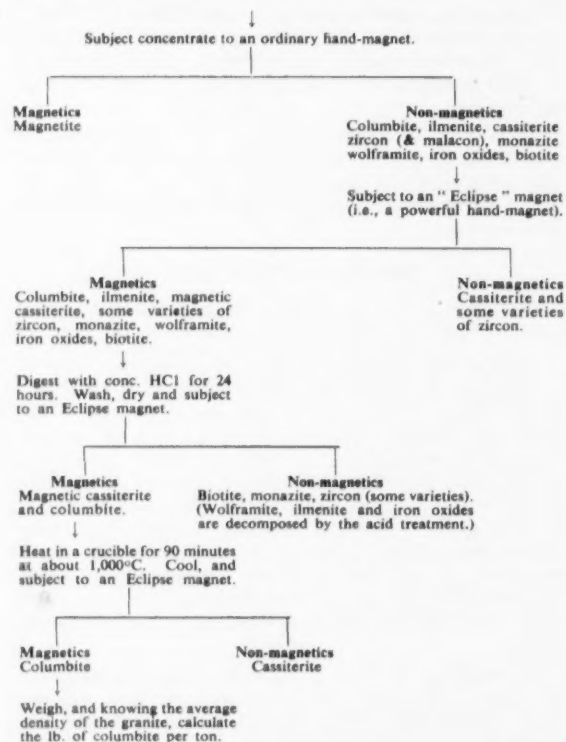
A chromatographic method of determining niobium in soils¹², depends on digesting a small but known quantity of the soil sample with hydrofluoric acid, placing a drop of the solution near one of the shorter edges of a rectangle of Whatmans No. 1 filter-paper, and after drying the spot in air standing the paper in a covered 600 ml. polythene beaker containing a 15:85 mixture of hydrofluoric acid and methyl ethyl ketone. As the liquid mixture ascends the paper the niobium in the test spot is separated from other components, transported some distance up the paper, and concentrated in a band. When the liquid front has almost

reached the top of the paper the latter is removed, dried in air, exposed to ammonia vapour and sprayed with tannic acid. The niobium band then becomes yellow, and the intensity of the colour and width of the band varies with the niobium content: thus, by comparing the chromatogram with standards the niobium content in the soil sample can be determined.

By this method as little as 4 p.p.m. of niobium can be detected. The method is, therefore, considerably more sensitive than the colorimetric one described above, but suffers from the disadvantage of employing highly toxic hydrofluoric acid.

DETERMINATION OF THE AMOUNT IN COLUMBITE-RICH GRANITE

Columbite-rich granite is unlikely to contain more than about 3 lb. of columbite per ton and it may often contain considerably smaller amounts. As no quick and, at the same time, reasonably accurate and simple method exists for determining the small amounts of Nb/Ta encountered in such material, and as it is of paramount importance to evaluate these granites with respect to their columbite content, the method which was employed in Nigeria by Jones¹³ to achieve this end should, in its original, or in an appropriately modified form, prove to be of the utmost value. Pan a known volume of rock previously crushed to minus 30-mesh if not decomposed until a large, dirty concentrate is obtained. Then:



The grade of a columbite concentrate is usually determined in the mill by employing a specific gravity test which for its effectiveness depends on the assumption that columbite possesses a specific gravity of 5.3 whereas that of any impurities is 4.5. Normally, a 100 g. of the concentrate is placed in a burette containing about 50 ml. of petrol and the displacement of the liquid is recorded. Some operators, at least, regard the concentrate as being of shipping grade if a 100 g. effects a displacement of from 18.2 to 18.6 ml.

Although this simple method is fairly reliable, it is the writer's opinion that whenever it is possible the results obtained by its use should be supplemented to some extent by those gained by conducting rapid chemical assays.

Methods of evaluating crude concentrates submitted for sale by native tributaries vary somewhat, but most, if not all, depend—largely or entirely—on visual examination with or without the aid of a hand-lens and direct or indirect consideration of the specific gravity of the material. Although such methods may appear to be very primitive they normally give sufficient information to an experienced buyer to enable him to purchase wisely.

Expansion of Yugoslavia's Bauxite and Aluminium Production

Bauxites play an important role in the overall mineral wealth of Yugoslavia, and increased exploitation, together with enlarged capacities at aluminium processing plants, have considerably increased the stature of the industry. The following article, condensed from *Commercial Information*, Vol. 8, No. 3, gives a brief outline of the producing mines and plants, pointing out that the favourable locality of the mines has aided the expansion of the industry.

Yugoslavia's producing bauxite mines are situated chiefly along the Adriatic coast, and thus particularly favourable conditions exist for the transportation of ore by sea to foreign consumers. These favourable conditions are facilitated further by the well-developed railway network extending between the mines and the ports. As is the case with other Yugoslav commodities, increasing tonnages of bauxite have been exported in recent years, and this overall increase in overseas sales has necessitated the expansion or restoration of existing ports or the construction of large new ones.

Prior to 1929 the bauxite mines of Yugoslavia were financed entirely by foreign capital, the bulk of the ore being exported mainly to the United States, the U.K., Germany and Italy. The overall development of the aluminium industry throughout the world, however, together with the discovery of new sources of raw materials, ultimately resulted in the cessation of exports of bauxite from Yugoslavia to the United States and Great Britain. On the other hand, the growing demand for aluminium in home industry necessitated the increase of overall output and the inauguration of new mines.

THE BAUXITE PRODUCERS

In each of the bauxite deposits currently being exploited the structure and quality of ore is subject to specific characteristics. The Drniš mine is one of the oldest bauxite producers in Europe and has yielded more than 6,000,000 tons from one vein. It is estimated that production of the Drniš ores will be profitable for a long time to come. The Drniš bauxites have a low silica content (1.4-2 per cent) and a high aluminium oxide content (53-55 per cent).

The ores from the Rovinj and Umag mines in Istria are rich in aluminium oxide at a content of 64-70 per cent while at the same time these ores are low in iron.

Intensive mining of the Mostar deposits began in 1951 in answer to increased market demand, the ore extracted being of reddish hue and of 50-64 per cent aluminium oxide content. This ore contains in addition some 1-3 per cent of silica. Mined ore is transported by lorries from Mostar and its environs to the railhead, whence it is carried to the new port of Kardeljevo for shipment.

High-grade bauxite has also been discovered in Nikšić in Montenegro. Exploitation was begun in 1950, and red and white bauxites of approximately 60 per cent aluminium

oxide content and a low percentage of silicon are currently being won. The ore is transported by road to Nikšić and shipped to Zelenika and Dubrovnik.

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All these mines are equipped with modern machinery while at the same time efficient transportation facilities are available. When full capacity operations are reached the estimated output will be:

Operating Mine	Output (000's tons p.a.)	Operating Mine	Output (000's tons p.a.)
Umag	35	Mostar	300
Drniš	200	Nikšić	150
Rovinj	185	Total output	870

The favourable conditions existing in the Yugoslav bauxite mining industry are such that output could be raised to 1,000,000 tons or more per annum should market demand warrant that production.

THE PROCESSING PLANTS

Until a comparatively short time ago, Yugoslav consumption of indigenous bauxites was negligible, and these conditions existed until last year when the Boris Kidrič aluminium and alumina plant was erected at Sibenik. Indeed, in 1954 exports of ore exceeded 500,000 tons, among the principal consuming countries being Germany and Italy, the former meeting some 60 per cent of its annual bauxite requirements of 800,000 tons with imports from Yugoslavia and the latter importing from the same source some 35 per cent of an annual requirement of 300,000 tons.

The increased factory capacity of Yugoslavia, however, now indicates that products will gain increasing importance as exported material. The new Boris Kidrič plant has an estimated annual capacity of 45,000 tons of alumina and 15,000 tons of aluminium, and its situation ensures adequate supplies of raw materials and electric power. This plant, in conjunction with several earlier installations, will yield a total of approximately 55,000 tons of alumina per annum.

At full capacity output the Boris Kidrič plant will produce approximately 10,000 tons of semi-finished products a year.

In addition, the reconstruction and expansion of the Impal factory at Slovenska Bistrica as well as of the new light metals factory at Sibenik will ensure an annual production of about 25,000 tons of aluminium manufactures and alloys. This increased output will mean, in effect, that Yugoslavia will begin to export a wide range of these products.

The Iron and Steel Industry

(From Our Iron and Steel Correspondent)

The steel boom continues to hit the headlines. A common feature of the reports from all the major producing centres in this country and overseas is the rapid rise in outputs, but still the demand outpaces the supply. Last month British ingot production reached an annual rate of 20,500,000 tons—1,000,000 tons in excess of the target figure for the year, yet still the steel famine persists and it is estimated that at least another 1,000,000 tons will have to be imported to meet the urgent needs of British industry.

Similar conditions are developing elsewhere. The recovery of U.S. steel since the turn of the year has been quite spectacular. Only a few months ago mill operations were ranging around 70 per cent of rated capacity. Now they are up to 92.5 per cent. Last week's actual ingot tonnage was 2,218,000 tons, the highest since June, 1953, and sober estimates are that the record melt of 111,000,000 tons reached in 1953 may be closely approached, if not exceeded.

Order books of the Canadian steel mills are similarly congested and delivery dates for cold rolled sheets are now extended to twenty weeks.

No less impressive is the report issued by the High Authority of the European Coal and Steel Community issued at the second anniversary of the establishment of the common market for coal.

In 1954 the six Community States attained their highest ever output of steel—43,800,000 tonnes. The report compares this figure with the 80,000,000 tons produced in the U.S., 41,000,000 tons in the Soviet Union, and 13,300,000 tons in the Eastern European bloc. It points out that despite boom conditions in the Community area, high speculative pricing, "previously normal in European booms," had been discouraged. Credit for this is claimed not only for the High Authority's fair trading code, but especially for the growing inter-Community competition reflected in the steady increase of across-frontier trading within the Community. It is shown, for instance, that during 1954, nearly twice as much steel crossed inter-Community frontiers as in 1952 which was the last year before the establishment of the common market, and over 23 per cent more ore.

STEEL PLANT IN PAKISTAN

Highlight of the news from the Far East is the report that Pakistan Industrial Development Corporation has completed plans for the establishment of a completely integrated steel plant with a capacity of 300,000 tons a year. It may be recalled that the Indian Government has placed a contract with Russia for a new steel plant but the Pakistan enterprise appears to be planned on a much more ambitious scale. A preliminary estimate places the ultimate capital expenditure at Rs.600,000,000 (nearly £65,000,000) which probably includes the cost of mining developments and power plant.

This grandiose scheme has its inspiration in the recent discovery of rich iron ore deposits in the Punjab and Chitral. The Pakistan Minister of Commerce recently revealed that at Kalabagh, in the Mianwati district, deposits of 20,000,000 tons of ore had been discovered, which figure might be raised to 100,000,000 tons.

This, of course, is one more step in the development of a world-wide impulse amongst the less industrialized countries to expand their manufacturing resources. The mineral wealth upon which the steel industry is based, is

widely diffused, and it is a natural, and legitimate ambition that each country should use its supplies to its own advantage. Upon international trade the impact must tend to be restrictive and this country as a leading iron and steel exporter will probably be amongst those more seriously affected.

Last year, U.K. iron and steel exports to India and Pakistan exceeded 161,000 tons, or about 7 per cent of our total shipments to overseas destinations. We are not faced with an immediate loss of that trade since the new projects outlined above will not be completed for several years at least. Moreover, as one door closes another opens and it is possible that the rising demand for steel will be sustained by big developments elsewhere.

OUTLOOK FOR U.K. STEEL

At all events the immediate outlook for British steel is absolutely unchanged. Month after month new records of production are set up only to be broken, stocks of pig iron, steel and scrap have been heavily drawn upon, and still supplies fall far short of requirements.

Later in the year more new plant will come into operation and it may be possible to reduce the heavy back logs which producers will carry over from the first to the second quarter of the year. But the acute shortages of sheet and tinplate can only be relieved by substantial imports and the high cost of these supplies strengthens the case for the inclusion of the new continuous strip mill in the further development programme which is now under consideration.

Still more urgent is the need for the further rapid expansion of pig iron production. At the end of January there were only 99 blast furnaces in operation—six fewer than there were a year ago. It is true that they are making more pig iron largely because several new and bigger blast furnaces have been substituted for older units of small capacity. But of the current output of pig iron, running at the rate of 12,500,000 tons per annum, 74 per cent consists of basic iron for the steel plants.

That still more of this grade of pig iron is required is indicated by the steady shrinkage of the steel makers' stocks. But the expanding needs of the foundry trade have hitherto received scant attention. Both the light and the heavy foundries need more iron. Possibly the supply of high phosphoric iron is sufficient, though even this is doubtful. On the other hand, there is no doubt whatever that production of haematite and low and medium phosphoric irons have fallen below the level of current requirements and arrangements have had to be made to import foreign iron even to North East Coast ports, notwithstanding the fact that this is the biggest pig iron producing area in the Kingdom.

There remains one other source of anxiety. Coal production is declining; stocks are at the lowest level for four years, and as the miners have been given yet another wage increase, a rise in coal prices is inevitable. By the more extensive use of gas and liquid fuel and also by improved techniques, the iron and steel industry has achieved substantial economies in the use of coal. The industry has received assurances that the adequacy of present and future deliveries of coal have been safeguarded, but dearer coal must inevitably have an inflationary effect on steel makers' costs of production.

Can a rise in steel prices be avoided if coal prices are advanced?

MACHINERY AND EQUIPMENT

A Scintillometer for Uranium Detection

Of Canadian manufacture, the model 963 scintillometer has been designed primarily to fill the requirement for a light-weight portable instrument of extreme sensitivity to be used in the search for uranium. As such, it is an essential tool of the prospector and geologist, and an indispensable aid to the mining engineer. Racal Ltd. are agents for the manufacturers in the United Kingdom, Europe and Commonwealth countries other than Canada.

The scintillometer may be used in all phases of the search and extraction of radioactive minerals from the initial prospecting, through the detailed survey of the deposit, to the examination and evaluation of the ore processing procedures. The light weight of the instrument and its ruggedness make it convenient and easy to carry in field work, and its sensitivity, nearly 300 times greater than that of the normal geiger-muller type of radioactive ore detector, enables extensive surveys to be carried out on foot, from a moving vehicle or from an aeroplane.

Some appreciation of the extreme sensitivity of the instrument can be gained from the fact that the strength of the standard radioactive source supplied for calibration purposes is only 5 micro-curies and this at a distance of 13 in. produces a count rate of 100 per sec., while at 1 in. the count rate is 5,000 per sec. A further instance of the sensitivity of the scintillometer is that gamma ray emanation from the luminous figures on the face of a wrist watch will register about 50 counts per sec. at a distance of 1 ft. from the instrument.

Powered entirely by lightweight long-life dry batteries, the instrument is free from all troublesome vibrator and rectifier power supply maintenance. The batteries which supply the valve filament are of normal flashlight type while those supplying the valve anode voltage are of standard hearing aid type. Maximum radiation detection sensitivity is obtained by the use of a large sodium iodide thallium activated crystal optically coupled to a ten-stage photo-multiplier tube. The output pulses for the photo-multiplier are amplified and shaped in the miniaturized amplifier circuit. The resulting pulses pass through an integrating circuit and cathode following to a micro-ammeter calibrated in terms of counts per sec.

A novel feature of this instrument is the fact that it will act as its own valve tester; period checks of valve efficiency can therefore be made very simply. All batteries are easily accessible for replacement purposes.

The internal components are protected by a weatherproof



The Model 963 Scintillometer

latex cover ensuring maximum efficiency over extended ranges of temperature and humidity. Housed in an all-metal case, which is contour shaped to sling comfortably against the body, the total weight of the unit is only 7 lb. Complete stability is achieved over the whole counting range of zero to 30,000 counts per sec.

Water Testing Equipment

One of the latest tools to be put in the hands of the prospector and others engaged in the search for mineral deposits is a small chemical kit for use in testing the base metal content of natural waters, according to a report in *The Northern Miner*.

McPhar Geophysics Ltd. has recently developed a technique for water sampling, packaged for convenience in field operation which, it is claimed, approaches the ideal requirements.

The kit with chemicals as prepared for field use consists of (a) two polyethylene squeeze bottles, each with a nozzle of the same material. One bottle contains a buffer solution designed to inhibit reaction of the naturally occurring iron and manganese in the water to be tested, the other bottle contains a 0.001 per cent solution of dithizone in chloroform; (b) one pyrex shaker bottle of 100 ml. capacity, with a 1 ml. tube welded to its inside surfaces; (c) carrying case; (d) colour chart and calculation diagram.

Procedure for the water test is that the 50 ml. of the water to be tested is dipped into the pyrex shaker bottle; 1 ml. of buffer solution is added to this water by inserting the nozzle of the buffer-filled squeeze bottle into the 1 ml. tube, and compressing the bottle until the tube has been filled. The pyrex bottle now containing water and buffer solution is stoppered and shaken, then opened again; 1 ml. of the dilute dithizone solution is then added by use of the nozzle and 1 ml. tube. The pyrex bottle is again stoppered and shaken vigorously for 30 seconds.

The dithizone solution does not mix with and is heavier than water, so collects in the bottom of the pyrex bottle. The amount of combined zinc, lead, copper, nickel, tin, cobalt and silver present in the water will determine the colour change in the dithizone. If the amount of these metals is less than .01 part per million the dithizone will remain at its original green shade or will darken only slightly. If the amount is just at .01 part per million, the dithizone will be a purple shade. If a bright crimson colour results, there is unreacted metal to excess, and further 1 ml. shots of dithizone must be added, with 10 seconds shaking after each shot, until the purple colour is reached.

Pumps for Mining Service

The pumps manufactured by Sigmund Pumps Ltd. have many and varied applications in the mining and quarrying industries as well as in boiler feed and condensate circulating, transfer boosting, drainage, filtration, purification, and in operations concerned with effluents and liquids containing solids.

For oil refining and similar industrial processes these units handle corrosive and volatile liquids in continuous processes and under arduous operating conditions. Units in the Sigmund process pump range are available to operate at temperatures up to 950 deg. F. and for pressures up to a maximum of 1,500 p.s.i.

Boiler feed, main circulating and other auxiliary services are typical applications. Multi-stage, high pressure pumps of the vertically split ring casing or barrel types are available for boiler feed duties at the highest pressures in current practice. These pumps are manufactured with branches up to 48 in.

Magnetic Conveyor Head Unit

A patented magnetic conveyor head system is claimed by the manufacturers, Electromagnets Ltd., to be the only one which develops two or three times the intensity of a pulley or drum of equal diameter. This Boxmag patent superintensity magnetic conveyor head unit in permanent magnetic form is equipped with Alcomax head. This head has a diameter of 6 in.

The patent magnetic conveyor head is not a pulley or drum and represents a completely new development and is stated to give a marked advance in tramp iron separation with great mechanical strength owing to the absence of thin drum covers and similar installations.

METALS, MINERALS AND ALLOYS

COPPER.—Copper supplies in the United States are desperately tight and the two main topics of conversation are whether the Government will consent to release stockpile copper and whether the copper producers will raise the domestic price again. Decisions on both these matters are expected shortly.

In discussion with the Government the brass industry has recommended that second quarter export quotas for copper and copper-base alloy scrap should be cut by half; a complete export embargo on domestic copper scrap and domestic refined copper to become effective on June 30 for the last half of 1955, or duration of the "emergency"; all copper scheduled for delivery to the Government under the Defense Production Act or for shipments into G.S.A.'s national stockpile should be diverted to industry for duration of the "emergency"; replacement of copper diverted from shipment to the stockpile last autumn to alleviate shortages caused by strikes in U.S. and Chile should be postponed beyond June 30, the original date set for replacement; and finally, copper should be taken immediately from the national stockpile, over and above amounts already diverted or withdrawn, in quantities sufficient to make up an estimated deficiency of 42,000 tons for the period up to and including May.

Opinion is that the producers will raise their price by another 3 c. to 36 c. per lb. Certainly the price of 33 c. is unreal; custom smelters have been getting 40 c. and dealers in imported copper 43 c. with both prices tending to rise. It is difficult, however, to see what advantage would follow from a producers price of 36 c. It would still be nowhere near the world free market price but it would be an invitation for substantial wage increases in the summer. It seems that the American producers are determined to have for themselves the worst of both worlds. It is also extremely unlikely that they will ever again be so ready to cut back production as drastically as they did in the autumn of 1953. Meanwhile, in London, spot copper has reached new record levels.

The news from Chile, where the threatened strike at Chuquibambilla is largely responsible for the recent price rises, is that interruption of output may be avoided. It is understood that Anaconda has made proposals for a settlement which are now being studied by the Government and the workers. It is improbable, however, that they could come very near to the workers' demands and some hard bargaining is still necessary; at the same time the workers must be in a strong position with Chile asking 40 c. for July metal at Chilean ports.

On the Copperbelt it is reported that the African labour force is now back to full strength and each mine will have a surplus labour pool. The second ballot among the European Union on African advancement went, surprisingly, the same way as the first. It seems unlikely that a favourable decision was expected from either ballot; the first was made compulsory to ensure that the decision could be taken as the unions considered view; the second ballot was only voluntary, and there was a much smaller number of voters but those against advancement were apparently even more apathetic about voting than those in favour of it. There can now be no doubt that the European Union is committed to accepting African advancement in some form. Recognition has now been granted by the Chamber of Mines to the African Staff Association. It is understood that an invitation to the African Mine Workers' Union to discuss the matter was not answered in time and that the Union's objections, if there had been any, therefore went by default. Meanwhile a conciliator has been appointed to assist in the dispute between the European union and the mining companies on three issues: the issue of a closed shop among contractors; the request for 52 working days annual leave a year; and a request for an alteration of shift working rates and conditions.

LEAD.—Demand for lead in New York was said to be excellent with the price firm at 15 c. per lb. There has been general buying and a continuation of unseasonable interest by battery makers. As a result of the recent spurt in consumer buying the industry now appears to be rather less worried at the prospects after mid-summer when the present stockpiling programme will have lost its authority. By then stocks should certainly be down to manageable proportions.

TIN.—There has been only moderate interest in tin with both buyers and sellers hesitant about making large commitments while important decisions are in the offing. Demand for tinplate in the United States is extremely good and there is a growing belief that the United Kingdom will continue to place orders so as to maintain overseas connections. The I.T.A. continues to hang fire and although there are occasional

reports that some of the outstanding consumers are edging closer, and that Ecuador has actually ratified as a consumer, there is no news yet of any decisive action by Indonesia or Siam.

C. A. Illegentz, United States Steel Corporation, is reported as saying that "the future of the Texas City tin smelter is of more importance marketwise than the proposed International Tin Agreement". He went on to forecast that the price of tin should "eventually hold at or something above the 90 c./lb. level". Nathan Trotter and Co. in a recent comment on the tin situation put the matter more strongly and appeared to suggest that Indonesia and Siam are awaiting the decision on the Texas smelter and that, if it is agreed to keep it operating, they will consider the I.T.A. for the time being unnecessary.

They would apparently rely on the smelter to keep world supply and demand in balance (which in the past year it has been doing). If this is the case, Siam and Indonesia could certainly expect to avoid output restrictions but they would sacrifice the comparative safety of the I.T.A. for the "security" offered by the Texas smelter which is notorious as a toy of vote-hunting politicians. Moreover, it might not be impossible for the Texas smelter to be kept working and, at the same time, to sell its output; that indeed would put the cat among the pigeons. But if it continues to produce and stockpile tin the pile would stand at about 700,000 tons in ten years' time which would clearly be ridiculous.

Although the need for a smelter is being investigated once again—this time by two Congressional committees—an immediate decision need not follow the release of their reports, so that without I.T.A. an uncomfortable few weeks may yet lie ahead. In fact, a Bill has been introduced in the House of Representatives to keep the smelter going for another year, ostensibly to provide time for the sale to private interests. To stir the troubled waters, the Bolivian Government has issued a memorandum seeking capital for its mining industry and a smelter. It bases its case for a smelter on the strategic interests of the Western hemisphere (the case best calculated to find American support) and is, on the same ground, bound to support the existence of the Texas smelter till the Bolivian smelter can be built. Clearly, Bolivian interest in the Longhorn plant is quite different from Indonesia's; Bolivia does not see it as a safeguard for prices, for Bolivia has already ratified the I.T.A. in pursuit of safety, but as a precursor of a national Bolivian smelter. Malayan production of tin in ore in February fell to 4,792 tons from 5,151 in January.

ZINC.—Demand for Prime Western at 11.50 c. per lb. East St. Louis was moderately firm in New York last week while demand for Special High Grade zinc was again outstanding. Notwithstanding some months of consistently good demand and many weeks of exceptionally tight supply, Special High Grade has kept its price relationship at 13 c. Yet if present conditions persist a widening of the margin would not be surprising.

Meanwhile, the American industry is maintaining its efforts to amend the Administration's foreign trade bill now before the Senate. Senator Watkins (Republican, Utah) has again argued that Congress should resume "a larger share of the direct responsibility for tariff making policy" and has indicated his intention of introducing amendments to the Reciprocal Trade Agreements Act. It will be recalled that a similar amendment to return tariff policy control to Congress was only narrowly defeated in the House of Representatives. It was also interesting to note that the President has before him at the present time one of the rare recommendations of the Tariff Commission for an increase in tariffs, this time on bicycles. If the President were to reject this recommendation while the Senate is discussing his proposed legislation, a combination of manufacturing and mining interests might well carry this amendment in the Senate.

Meanwhile yet another witness before the Senate Finance Committee has been Mr. Romney, manager of Utah Mining Association, who said that "domestic mineral exploration is dying" and added that, against 74 lead-zinc mines operating in Utah in 1948 only 7 reported lead-zinc production to the State Tax Commission in 1954.

ALUMINIUM.—The pattern of bauxite supplies in the U.S. last year is revealed in a recent Bureau of Mines report. Out of total supplies available during the year amounting to 7,198,147 tons, approximately 5,300,000 tons were imported, while practically the whole of the domestic production came from

Arkansas. Surinam provided the bulk of the imports at around 3,100,000 tons the remainder coming from Jamaica (2,000,000) and British Guiana (175,000). Total supplies were approximately 20 per cent upon 1953 the increase in imports coming almost entirely from Jamaica and British Guiana which together supplied nearly 1,000,000 tons more than in the previous year.

It is reported from Jamaica that Aluminium Ltd. is planning the expansion of alumina production on the Island to supply the growing requirements for the Kitimat smelter and elsewhere. The expansion envisages raising capacity from its present level of 230,000 s.tons a year to over 300,000 tons. The expanded facilities are being planned in such a way to provide the basis for yet a further expansion of 150,000 tons at a later date.

In Austria, virgin aluminium production last year reached the record total of 57,238 tons compared with 49,994 in 1953.

CADMIUM.—Output of cadmium in Western Germany last year amounted to 270 tonnes against 103 tonnes in 1953. Last year's production is, of course, a post-war record, and compares with a total of 432 tonnes in 1938.

CHROME.—U.S. chrome consumption dropped sharply last year, according to the U.S. Bureau of Mines, to a total of 913,973 s.tons, compared with 1,335,755 s.tons in 1953. Overseas suppliers appear to have been the main sufferers as imports were down to 1,470,078 s.tons against 2,226,610 s.tons in the previous year, while domestic output rose sharply to 159,743 s.tons compared with 58,817 s.tons.

MAGNESIUM.—Pending the removal of the Allied ban on West German production of magnesium on a commercial scale, German industry has been estimating the probable scale of home demand for this metal. The figure is put at 8,000 tonnes a year at the moment, but it is thought that the growing potential from the motor car and electrical industries will eventually cause this requirement to be exceeded. During the peak of the war effort, Germany was producing over 30,000 tonnes per annum.

URANIUM.—Australia has shipped her first commercial consignment of uranium oxide to the U.S. This shipment, valued at £A200,000, came from the Rum Jungle refinery under the ten year agreement with the Anglo-American Combined Uranium Development Agency.

GOLD.—Western Australian gold output in 1954 amounted to 851,151 oz., compared with 823,912 oz. in 1953.

The London Metal Market

(From Our Metal Exchange Correspondent)

Once more markets have had a very uninteresting week in spite of the continued rise in the price of copper, which, however, this time has been accompanied by a marked falling off in turnover.

The immediate outlook for the copper market is uncertain, as it has been expected since January that the main impact of the Rhodesian strike would be felt at the end of March and beginning of April, and the position has now been aggravated by the effect of the reduction in exports from America. Thus, even if the possibility of a strike in Chile is removed, prices may remain at their present levels, or even increase still further, before the flow of copper from Rhodesia and the cessation of replacement orders from Western Germany enables the price to fall back to a reasonable level, which a number of people think would be around the £300 per ton mark. The other point of conversation during the week has been the extraordinary price structure which has developed in the United States where there are now at least three levels ranging from 33 c. per lb. to 43 c. per lb., and it is generally expected that the producers will raise the lowest of these quotations to 36 c. or 37 c. per lb. in the near future. It has been pointed out, however, that this will not attract any additional copper to the States where the shortage seems likely to continue for some months to come, but strangely enough if U.S. prices are kept down this state of affairs will not be a "bull" point for the London market.

Lead and zinc have been quiet, and talk is now being heard about what will happen when the present U.S. stockpiling policy expires on June 30, whether it will be continued or replaced by higher duties. In any event the markets seem to be entering upon a period of uncertainty, and the price of both metals is likely to follow any downward movement in the copper price.

The tone in the tin market has been better than of late although price movements have been small. The main topic has

been the future of the Texas smelter, and it is being pointed out that it is not so much the fact of the smelter which matters as what will happen to the tin produced if it goes on, or to the concentrates if it shuts down. On Thursday morning the Eastern price was equivalent to £727 per ton c.i.f. Europe.

Closing prices and turnovers are given in the following table:

	March 17		March 24	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£351	£351½	£356	£357
Three months	£342	£342½	£347½	£348
Settlement		£351½		£357
Week's turnover		4,900 tons		3,600 tons
Tin				
Cash	£714½	£715	£713	£714
Three months	£716	£716½	£714½	£715
Settlement		£715		£714
Week's turnover		690 tons		535 tons
Lead				
Current half month	£104½	£105½	£104	£104½
Three months	£103½	£104	£103	£103½
Week's turnover		2,825 tons		2,575 tons
Zinc				
Current half month	£89½	£89½	£88	£88½
Three months	£87½	£88	£86½	£87
Week's turnover		5,925 tons		3,325 tons

TWO INTERESTING CHARTS

A. Strauss and Co. Ltd. have prepared a chart showing the distribution of tin throughout the world, as well as sites of mining and smelting operations and areas where tin is consumed. Only the more important countries are included, namely those producing or consuming a minimum of 2,000 l.tons per year. A chart comparing the price of tin with other primary commodities is incorporated. A limited number of copies are available from the company at Plantation House, Mincing Lane, London, E.C.3.

Vivian, Younger and Bond Ltd., Princes House, 95 Gresham Street, London, E.C.2, have issued a chart showing the movements of copper, lead, tin and zinc for the twenty years ended 1954. A limited number of these charts are available at the above address.

OTHER LONDON PRICES — MARCH 24

ANTIMONY

English (99%) delivered,	
10 cwt. and over	£210 per ton
Crude (70%)	£200 per ton
Ore (60% basis)	22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade)	£519 per ton
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OTHER METALS

Aluminium, 99.5%, £163 per ton	Osmium, £30 oz. nom.
Bismuth	Palladium, £6 5s./£6 15s. oz.
(min. 2 cwt. lots) 16s. lb.	Platinum, £27/£27 15s.
Cadmium (Empire) nominal	Rhodium, £41
Chromium, 6s. 5d./7s. lb.	Ruthenium, £16 oz.
Cobalt, 21s. lb.	Quicksilver, £109 10s.
Gold, 251s. 1d.	ex-warehouse
Iridium, £30/£32 oz. nom.	Selenium, 43s. nom.
Magnesium, 2s. 4d. lb.	per lb.
Manganese Metal (96%-98%)	Silver, 77½d. f.o.z. spot and
£225/£262	76½d. f'd
Osmiridium, £40 oz. nom.	Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth	50% 7s. 3d. lb. c.i.f.
	40% 6s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-	
frangible) 48%	£13 per ton c.i.f.
" Refractory 45%	£13 per ton c.i.f.
" Smalls 42%	£10 2s. 6d. per ton c.i.f.
Magnesite, ground calcined	£26-£27 d/d
Magnesite, Raw	£10-£11 d/d
Molybdenite (85% basis)	105s. 3d.-108s. 1d. per unit c.i.f.
Wolfram and Scheelite (65%)	232s. 6d./237s. 6d. c.i.f.
Tungsten Metal Powder	20s. nom. per lb. (home)
(98% Min. W.)	
Ferro-tungsten	17s. nom. per lb. (home)
Carbide, 4-cwt. lots	£37 6s. 3d. d/d per ton
Ferro-manganese, home	£54 15s. 0d. per ton
Manganese Ore Indian c.i.f.	
Europe (46%-48%)	66d./68d. per unit nom.
Brass Wire	3s. 3½d. per lb. basis
Brass Tubes, solid drawn	2s. 8½d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

The main feature in stock markets during the past week was the continuing decline in business. This trend was caused by many different factors, all pointing towards uncertainty and caution. Among them were the budget, talk of an early general election, Mr. Bevan, and the U.K. terms of trade. On the favourable side of the picture, sterling continued firm in overseas markets and the revenue position is much stronger than last year.

The Kafir market has been torn by rumour and counter-rumour. The South African budget is expected as we go to press, and share prices have naturally been erratic. Mr. Louw's speech is nevertheless awaited with confidence as the South African financial position remains very strong. A feature among finance houses was the increase in the Anglo American Corporation dividend from 60 per cent to 70 per cent for the year. The company recorded peak profits of over £4,000,000. With new properties soon to come into production this distribution should be comfortably maintained. Union Corporation are also paying more. The total for the year is 2s. 8.9d. against 2s. 5d.

Randfontein encountered good buying at the beginning of the week and at one time rose to over 67s. Later, profit-taking set in. Buyers were apparently optimistic that March would show good returns. Elsewhere, price changes among Rand properties were erratic although more interest was shown in Far West Rand shares, such as Dominion Reefs and Vaal Reefs.

In the Orange Free State, the main talking point was the sale by Freddie's Consolidated of the Freddie's South No. 2 shaft to Free State Geduld, together with some 1,300 claims. This is likely eventually to be of advantage to both parties but developments are likely to take some time. Loraine dropped initially on rumours that the property would be placed on a care and maintenance basis; this was later denied by the company and the share price recovered. Free State Geduld shares were a weak spot despite their bargain with Freddie's Consolidated. It was rumoured that there had been some forced

selling. Optimism concerning development results attained by President Brand on the St. Helena boundary sustained the share price. The next returns will be awaited with considerable interest for confirmation or otherwise of this rumour.

Rather more interest was taken in West Australian gold mines and prices of the leading issues hardened.

Among miscellaneous gold shares, Cam and Motor were a better market and most of the Indian mines were also firmer.

Coppers were a very good feature. Big gains in price occurred almost everywhere in the market. Investment demand for Chartered found the market ill supplied with stock and the price responded accordingly. Rio Tinto's activities in the uranium field in Canada and Australia caused renewed interest in the shares. The price of copper touched a record level during the week but later turned easier. Rumours of a strike in Chile and the probable emptying of the Rhodesian pipeline caused this. Nevertheless, Rhodesian properties have good coal stocks on hand following the strike and their powers of boosting production in the past have been remarkable.

Eastern tin shares responded to the improved industrial expansion in the United States coupled with the hope that the consumption of tin will increase accordingly. Pengkalen and Gopeng were especially bright features due to the dividends. Nigerians were patchy but leading producers gained the turn.

Lead/zincs, particularly Barriers, hardened after last week's shakeout. Buying was on a modest scale but sentiment and the general tone was distinctly better. Most of the mines are substantial producers of silver, the price of which has recently improved both in London and in New York.

Among miscellaneous base metal issues, South African collieries, hardened on the optimistic financial outlook for the Union. Wankie Coal were also a firm market.

Canadians were listless. Price changes generally were negligible, but International Nickel continued to suffer from moderate profit-taking.

FINANCE		Price	Mar. 23 on week	RAND GOLD contd.		Price	Mar. 23 on week	DIAMONDS & PLATINUM		Price	Mar. 23 on week	TIN (Nigerian and Miscellaneous) contd.		Price	Mar. 23 on week
African & European	31	—	—	W. Rand Consolidated	44/4	—	—	Anglo American Inv.	74	—	—	Gold & Base Metal	2/7 1/2	—	—
Anglo American Corp.	21/10 1/2	—	—	Western Reefs	42/6	—	—	Casta	23/9	—	—	Jantar Nigeria	8/1	—	—
Anglo-French	28/9	—	—	O.F.S. GOLD	—	—	—	Cons. Diam. of S.W.A.	7	—	—	Jos Tin Area	13/9	—	—
Central Mining (L1 shrs.)	39/6	—	—	Freddie's	5/-	—	—	De Beers Pfd. Bearer	5 1/2	—	—	Kaduna Prospectors	2/6	—	—
Consolidated Goldfields	55/7 1/2	—	—	Freddie's Consolidated	7/9	—	—	De Beers Pfd. Bearer	16 1/2	—	—	Kaduna Syndicate	2/6	—	—
Consol. Mines Selection	38/9	—	—	F.S. Geduld	4 1/2	—	—	Pots Platinum	8/-	—	—	London Tin	7/6	+1 1/2	—
East Rand Consols.	2/9	+1 1/2	—	Geoffries	17/9	—	—	Waterfall	14/4 1/2	—	—	United Tin	2/9	—1 1/2	—
General Mining	5 1/2	—	—	Harmony	34/3	—	—	COPPER	—	—	—	SILVER, LEAD, ZINC	—	—	—
H.E. Prop.	9/7 1/2	—	—	Loraine	12/3	—	—	Bancroft	42/9	—	—	Broken Hill South	51/3	—	—
Johnnies	40/-	—	—	Lydenburg Estates	21/3	—	—	Chartered	109/9	—	—	Burma Corporation	2/10 1/2	—1 1/2	—
Rand Mines	34	—	—	Merriespruit	12/3	—	—	Esperanza	5/11 1/2	+4 1/2	—	Consol. Zinc	41/30 1/2	—	—
Rand Selection	40/7 1/2	—	—	Middle Wits	17/6	—	—	Messina	7 1/2	—	—	Lake George	12/10 1/2	—	—
Union Corporation	40/-	—	—	Ofsits	3 1/2	—	—	Nchanga	12 1/2	—	—	Mount Isa	50/9	—	—
Vereeniging Estates	41	—	—	President Brand	70/7 1/2	—	—	Rhod. Anglo-American	95/-	—	—	New Broken Hill	35/-	+1 1/2	—
Writs	40/-	—	—	President Steyn	41/-	—	—	Rhod. Katanga	17/9	—	—	North Broken Hill	71/3	+1/3	—
West Wits	38/9	—	—	St. Helena	29/3	—	—	Rhod. Selection	34/6	—	—	Rhodesian Broken Hill	13/-	—	—
				Virginia Ord.	16/-	—	—	Rhokana	35 1/2	—	—	San Francisco Mines	23/3	+1/-	—
				Welkom	24/6	—	—	Rio Tinto	49	—	—	Uruwiri	5/3	—3d	—
				Western Holdings	4 1/2	—	—	Roan Antelope	25/1 1/2	—	—	MISCELLANEOUS	—	—	—
								Selection Trust	67/9	—	—	BASE METALS & COAL	—	—	—
								Tanks	6 1/2	—	—	Amal. Collieries of S.A.	48/9	+9d	—
								Tharsis Sulphur Br.	5 1/2	—	—	Associated Manganese	38/9	+9d	—
												Cape Asbestos	10/9	+3d	—
												C.P. Manganese	40/3	+3d	—
												Consol. Murchison	62/6	+9d	—
												Natal Navigation	2 1/2	—	—
												Turner & Newall	99/9	+9d	—
												Wankie	17/9	+3d	—
												Withbank Colliery	4	—	—
												CANADIAN MINES	—	—	—
												Dome	530	—	—
												Hollinger	529 1/2	+4	—
												Hudson Bay Mining	510 1/2	—	—
												International Nickel	512 1/2	—	—
												Mining Corp. of Canada	512 1/2	—	—
												Noranda	515 1/2	—	—
												Quebec	47 1/2	+1 1/2	—
												Yukon	4/-	—1 1/2	—
												OIL	—	—	—
												British Petroleum	72/-	—2/-	—
												Apex	27/9	—3d	—
												Attock	45/7 1/2	+7 1/2	—
												Burmah	5 1/2	—	—
												Canadian Eagle	20/9	+2 1/2	—
												Mexican Eagle	48/6	—3d	—
												Shell	6 1/2	—	—
												Trinidad Leasehold	29/6	—9d	—
												T.P.D.	25/-	—3d	—
												Ultramar	27/3	—1 1/2	—

COMPANY NEWS AND VIEWS

Anglo American Pays More From Record Profits

With the declaration of a final dividend of 50 per cent on its issued ordinary capital of £3,643,671 in ordinary shares of 10s. each, the Anglo American Corporation of South Africa has raised its ordinary distribution in respect of the year ended December 31, 1954, from 60 per cent to 70 per cent. This is the highest dividend yet paid by the Corporation.

Profits earned, after taxation, reached the record level of £4,025,000, an increase of £759,754 over the previous year's figure of £3,265,246. With the transfer of £1,100,000 to general reserve as against £1,000,000 a year ago, the total fund in this account is brought up to £20,000,000.

Sir Ernest Oppenheimer is chairman. Anglo American 10s. ordinary shares at present stand at around 158s. at which price the yield is nearly 4½ per cent.

Union Corporation Earns Less But Pays More

With the declaration of a final dividend of 1s. 10d. less tax per 2s. 6d. share on the issued ordinary capital of £1,162,500—which represents the departure from the usual practice of making all distributions tax free—dividends paid by Union Corporation in respect of the year ended December 31, 1954, are brought to a gross total of 2s. 8.909d. from the previous year's figure of 2s. 5.091d.

After the higher provision for U.K. taxation at £502,800 as against £433,700, profits declined to £1,081,279 from £1,127,195; and although the preliminary profit statement gives no breakdown of the sources from which the past year's profits were drawn, the bulk will no doubt have come from investment income which during the year ended December 31, 1953, provided about £1,600,000 from total earnings of £1,813,000.

The balance of income must, of course, come from investments, realized profits, and net revenue from fees, interest and sundry receipts. It is also interesting that during the past year an amount of £275,000 was placed to exploration reserve which marked a decrease of £325,000 from the £600,000 so allocated in 1953. These large appropriations, it is thought, are in connection with the active exploration programme which the company is carrying out in the Bethal area of the Far Eastern Rand. The news is, in fact, being anxiously awaited as to the possible flotation in the near future of two new mines in this area. Another appropriation during the past year was a sum of £81,000 (nil) which was received by the Pension Fund Account. Lord Bracken is chairman.

Freddies Cons. Sells No. 2 Shaft to F.S. Geduld

Following the recent decision by Freddies Consolidated Mines to stop development operations in the southern section of its mine, arrangements have been concluded whereby the No. 2 south shaft, together with ancillary equipment and buildings and approximately 1,300 claims, will be sold to Free State Geduld Mines for the consideration of £1,500,000.

The price, which excludes the South Reduction Plant, will be met by the issue of 300,000 Free State Geduld shares. As funds are urgently needed by Freddies Consolidated Mines to finance its current intensive development programme, arrangements have been concluded whereby the Johannesburg Consolidated Investment Company and the Anglo American Corporation of South Africa have undertaken to buy F.S. Geduld shares from Freddies Consolidated from time to time as funds are required. The prices payable have regard to market conditions at the date of each purchase.

Although this latest arrangement is undoubtedly of great benefit to Freddies Consolidated, it is not so immediately apparent as to how the acquisition of a shaft lying due north from a point approximately half way between Free State Geduld Nos. 1 and 2 shafts will materially assist mining operations at the latter property. Some indication of its use is, however, contained in the announcement which states that it will provide additional ventilation as well as access to the northerly part of Free State Geduld's property. It would appear however, that the part of Free State Geduld's property most in need of an extra shaft would be that area lying to the east and north-east of No. 2 shaft. Moreover, in view of the direction present development is taking it is unlikely that much underground work will be undertaken in the northern part of the property for some years to come.

Be that as it may, there is no doubt that so far as its issued capital is concerned, Free State Geduld has made a bargain.

G.M.K. Sells Croesus Treatment Co.

As a result of recent purchases by Gold Mines of Kalgoorlie (Aust.), interests were acquired in the Croesus Proprietary and Kalgurli Ore Treatment Companies. With the completion of the current G.M.K. (Aust.) mill expansion programme, however, there will be no use for the milling capacity provided by these companies. The interest in Croesus Proprietary has therefore been sold to North Kalgurli (1912) for £150,000.

In last week's issue of *The Mining Journal*, page 302, it was incorrectly implied that this sale concerned both the Croesus and Kalgurli Companies.

Non Ferrous Metal's Sharp Increase in Revenue

The transfer of Non Ferrous Metal Products' resources from Government securities to higher yielding investments was again a major reason for the increased revenue earned during the year ended December 31, 1954. Holdings of Government issues were, in fact, reduced to 11.5 per cent of total investment valuation from the previous year's figure of 25.6 per cent.

Year to Dec. 31	Total Revenue £	Tax- ation £	Net Profit £	Divi- dends £	To Reserve £	Carry Forward £
1954	70,834	28,333	28,086	22,344	5,000	13,535
1953	47,553	23,129	20,458	18,620	Nil	12,796

A dividend of six per cent was paid on the issued ordinary capital of £677,084 representing an increase of one per cent over the previous year's distribution.

There are two points of particular note with regard to the company's balance sheet. Firstly, an issue of £400,000 3½ per cent first debenture stock 1974-78 was created and placed privately during the year, and secondly, the market value of quoted investments made a considerable advance to £1,632,711 from the previous figure of £927,237. These investments are shown on the balance sheet at the very much lower figure of £991,346.

At the annual general meeting which will be held in London on March 29, a special resolution is to be considered for changing the company's name to the Western Stockholders Investment Trust. While the new name more accurately reflects the nature of the business, it also indicates the company's association with the "Stockholders" group of investment trust companies. Mr. John R. Govett is chairman.

Esperanza Will Consider Dividend Payment in 1955

In a circular to shareholders Mr. A. Hedley Williams, the chairman and managing director of the Esperanza Copper and Sulphur Company, has stated that every consideration will be given to the payment of a dividend in 1955. As Mr. Williams has previously explained, however, results for the year ending March 31, 1955, must inevitably be poor due to setbacks mainly connected with water supplies and delayed plant deliveries.

But no major obstacle is now foreseen which could prevent full production being reached and deliveries in connection with the new regrinding plant which will produce high grade pyrites concentrates are complete. This plant started up on February 25 and the company is accordingly now in a position to meet contracts for 50,000 tons of pyrites concentrates for the current year. It has also been disclosed that the new mill at Limni—which came into operation on December 15, 1954—has produced some 5,000 tons of pyrites concentrates to date.

The value of production from all sources for the month of February, 1955, has been estimated at over £35,000. This, however, represents only about half the estimated output of pyrites concentrates, in addition to which no copper, gold or silver has yet been recovered. The extraction of these metals from the Limni ore formed part of the original plan for the development of the property which envisaged an annual working profit of over £450,000.

It will be recalled that at Esperanza's recent meeting, polls were demanded on resolutions for the re-election of Mr. P. A. Ashmead-Bartlett, and the appointment of Mr. Cyril Murray as directors of the company. These polls were accordingly taken on March 18 and gave the following results: a total of 1,999,541 votes were in favour of the election of Mr. Ashmead-Bartlett compared with only 986,624 against; while 1,927,049 votes were against Mr. Murray's election as compared with 1,070,406 in favour.

JANUARY MINE RETURNS

AUSTRALIAN GOLD

Company	4 weeks to Jan. 25 1955		4 weekly period since year-end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Boulder Perseverance	8.9	1,675	11	111.7	25,468	111.5	27,482
Central Norseman	11.7	6,381	11	133.2	69,682	131.0	63,870
Central Victoria*	100.2	4,011	11	1570.8	4,823	2356.7	8,431
G.M.'s of Kalgoorlie	16.7	4,501	11	169.7	46,984	165.6	47,870
Gr. Western Cons.	30.0	4,544	11	358.9	46,852	289.5	36,355
Morning Star	0.9†	575	11	14.1	9,367	15.3	14,955
New Coolgardie	5.2	2,525	11	56.7	28,495	58.6	27,147
North Kalbarli	19.2	4,279	1	19.2	4,279	19.4	4,185
Sons of Gwalia	8.9	1,704	1	8.9	1,704	7.6	1,545
South Kalbarli	7.7	1,669	11	86.4	18,448	97.0	19,434

* Cu. yd.

† One day holiday

SOUTHERN RHODESIAN GOLD

Company	January, 1955			Months since year-end	Current Financial Year Total to date			Last Financial Year Total to date		
	Tons (000)	Yield (oz.)	Profit (£000)		Tons (000)	Yield (oz.)	Profit (£000)	Tons (000)	Yield (oz.)	Profit (£000)
Arcturus	3.2	948	3.2	7	21.4	6,474	22.4	21.7	—	20.6
Cam & Motor	24.5	7,553	40.3	7	169.0	52,903	289.3	170.2	53,013	314.7
Falcon Mines	16.8	3,012	13.9	4	68.9	12,539	48.1	66.4	10,733	25.1
Globe & Phoenix	6.2	3,548	24.1	1	6.2	3,548	24.1	6.0	3,521	23.3
Motapa Gold*	115.4	2,109 L	3	1	15.4	2,109 L	3	18.5	2,469	3.6
Muriel Mine	3.1	1,114	10.0	7	21.8	6,903	70.4	14.3	—	48.3
Tebekwe	7.2	950	1.4	7	52.1	6,962	9.1	57.4	—	18.4

† Additional revenue not included of £434 £396 and has been received, being adjustments on Oct. and Nov. 1954 output. Operations affected in January by curtailment in power supply.

MISCELLANEOUS GOLD

Company	January 1955		Months since year-end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Br. Gu. Consol.*	153.2	1,961	1	153.2	1,961	168.9	1,656
Clutha River*	237.0	538	11	2412.0	4,738	2458.0	4,971
Frontino	12.3	6,039	1	12.3	6,039	9.1	6,360
Kentana (Geita)	22.9	3,510	7	156.1	23,986	152.8	23,146
New Gu. Glidds	3.7	1,312	4	14.2	6,082	12.4	5,080
St. John d'El Rey	25.4	110†	1	25.4	110†	26.8	126†

* Cu. yd. (000) dredged

† Value £000

TIN OUTPUT IN TONS OF TIN CONCENTRATES

Company	Jan.	Month since year end	Financial Year to Date		Company	Jan.	Month since year end	Financial Year to Date	
			This	Last				This	Last
EASTERN									
Ampat	120†	1	120†	99†	NIGERIA				
Benjutai	68†	8	557†	479†	Bisichi†	44	1	44	22
Ipo Tin	28†	10	442†	313†	Ex-Lands	58	1	58	70
Kamunting	69	10	881†	1154†	Gold & Base	43	1	43	43
Kinta K.	7†	10	178†	263†	Gold & Base†	15	1	15	104
Kinta T.	33	1	33	26†	Jantar	21	4	81	66
Klang River	14†	10	235†	405†	Jos Tin	20	2	74	72
Kramat Tin	41†	10	315	—	Kaduna P.	12	6	77	77†
Kuala K.	169	10	209†	1613†	Kaduna S.	5	1	5	8†
Kuchai	49	4	173	122	Keft†	Nil	10	72	47†
Larut	90†	1	90†	78†	Keft†	41	10	364†	139†
Lower Perak	184	9	1488†	931	Lond. Nig.	20	10	217	231†
Malaysiam	11†	10	109†	100†	Naraguta Ex.	6†	1	6†	5†
Pahang	220	6	1320	1320	Naraguta K.	14†	1	14†	15†
Rahman H.	40†	7	252†	285†	Naraguta T.	16†	1	16†	16†
Rantau	69†	7	448†	425†	Naraguta T.†	7	1	7	7
Rawang Conc.	32†	10	415†	598†	Ribon	10†	10	91†	104
Rawang Tin	77†	10	657†	341†	Ribon†	1†	10	11†	15†
Renong	118†	7	769†	646†	S. Bukeru	7	1	7	9†
S. Kinta	438†	10	398†	3864†	S. Bukerut†	1	1	1	Nil
Siamese Tin	203	1	203	131†	Tinfields of Nig.	2†	10	26	22†
Sungei Kinta	15†	1	15†	14	Tinfields of Nig.†	2†	10	26†	1.2
Taipung	57	1	57	55†	U. Tin	13	7	93	55
Tambah	16†	1	16†	21†	U. Tin†	3†	7	25†	1.2
Tanjong	99†	1	99†	58†	MISC.				
Tongkah	81†	7	265†	278†	Beralit Tin	8	10	50	74
NIGERIA									
Amal Tin	398	10	3358	3376	Beralit Tin†	185	10	1719	1922
Amal Tin†	60	10	507	600	Geovor	54	10	520	568
Bisichi	78	1	78	55	Sth. Crofton Tin	55†	1	55†	53†

† Columbite

† Wolfram

** The Rawang No. 3 dredge completed trials and commenced operations on January 1, 1955

§ Amang output—Harbour dredge closed from January 1 for major overhaul

OIL OUTPUT

Company	January 1955 (in tons)	Months Since Year End	Cumulative Totals (in tons)	
			This year to date	Last year to date
Anglo Ecuadorian	28,422	10	274,600	262,414
Apex Trinidad	39,289	4	152,607	149,098
Kern Oilfields	25,937	8	210,539	221,293
Kuwait Oil	4,244,743	1	4,244,743	3,326,758
Lobitos Oil	45,728	1	45,728	40,949
Trinidad Central	8,916	1	8,916	7,907
Trinidad Leaseholds	84,069	7	569,212	527,831
Trinidad Petroleum	41,656	6	246,762	237,474
Ultramar Oil†	117,137	1	117,137	112,337
Qatar Petroleum	405,447	1	405,447	382,012

Note—1 ton taken to equal seven barrels

† Output figures are for S.A.P. Las Mercedes in which Ultramar holds a 50 per cent interest

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Applications are invited for the post of Head of the Mining and Geology Department, shortly becoming vacant through the retirement of Mr. Robert M. Chalmers, M.C., B.Sc., M.I.Min.E. Duties will commence on September 1, 1955, or such other date as may be arranged.

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Further particulars and application form will be sent by the undersigned on receipt of a stamped, addressed foolscap envelope. Applications not on the form provided will be disregarded. Last date for receipt of applications: Monday, April 25, 1955.

E. C. SMITH,
Principal.

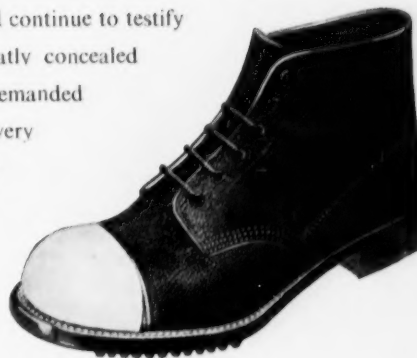
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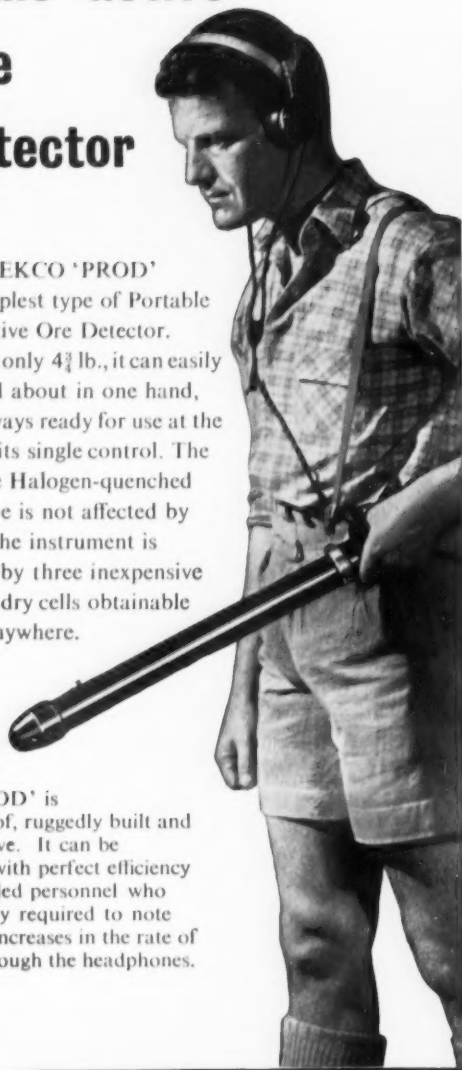
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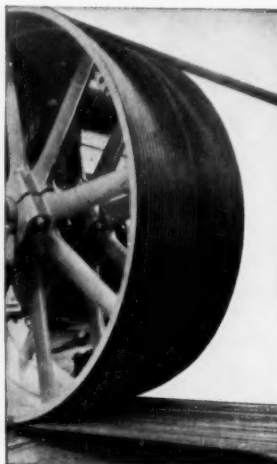
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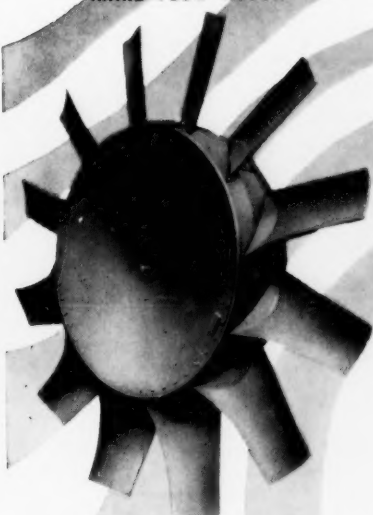
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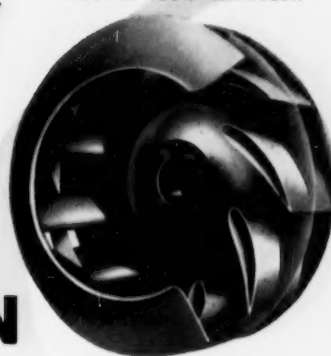
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